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EDITORIAL.

Improvement of Derris Stock.

Research work conducted at the Department of Agriculture on derris has been mainly directed to a study of the varieties or strains, the toxic content of each, variations in toxicity under different conditions—such as age of plant and environment—with the ultimate object of encouraging the cultivation of varieties of high toxicity and of eliminating as far as possible, the variability in quality of commercial consignments of roots.

Articles describing the conduct and progress of these experiments have been published from time to time in this Journal and in the series of special bulletins published by the Department, and have commanded considerable attention in Malaya and elsewhere, to such an extent that certain numbers of these publications are now out of print.

The wide interest evinced in this subject is disproportionate to the present importance of the crop, for the total annual exports of the dried root from Malaya and the Netherlands Indies—the two principal countries of export—do not greatly exceed 1000 tons.

It would appear, therefore, that the interest emanates from planters who look to this crop as a possible source of revenue, and from manufacturers, who see in derris a useful and safe source of insecticide.

The duty of the Department of Agriculture is to guide planters as to the varieties to grow and to assist the trade by ensuring a high-grade product. Considerable progress has been made towards the attainment of these objects, and while at the present time finality has not been reached, the knowledge gained by the Department and made available to planters is sufficiently certain that definite recommendations can be made as to the comparative values of varieties.

An article in the present number on selection experiments with *Derris malaccensis* produces evidence of the behaviour of this variety when grown under different conditions, and shews the variation in toxicity that may be expected between one plant and another.

The authors of the article in this issue point to two conclusions which are of such importance that they are worthy of repetition in this place. Evidence is adduced to prove that while there is considerable variation between one plant and

another, toxicity is not materially affected by environment nor by the weight of crop. The practical bearing of these conclusions is that good quality plants of satisfactory toxicity wherever planted in Malaya should give crops of a predictable toxicity irrespective of whether the particular yield of crop per acre is satisfactory or otherwise. This being so, the more general adoption of proven good stock will go far towards the attainment of the main object of this investigation, namely, to eliminate variability in quality of root offered to the market.

The production of a high quality product will not, however, settle all the difficulties which the planter may encounter. With the greatly increased acreage planted during the past year or so, the market—as yet a small one—may become overstocked, with a consequent lowering of the price level. In some degree this indeed appears to be evident at the present time, for prices have declined considerably during the past few months.

With increased stocks on the market, the buyer will become more discriminating, under which conditions high quality root alone may be sufficient to satisfy the market requirements. We cannot too strongly urge prospective planters to investigate carefully the requirements of the market before embarking on production, in order that ultimately they may be in a position to offer a high quality product which will prove attractive to buyers.

A further point in connexion with marketing is that of preparation of the product for the market. There has, in the past, been a prejudice against the marketing of derris in a powdered form, it being held that there is loss of toxicity on storing such material. As has been pointed out in a previous paper on this subject, investigations have shewn that there are no grounds for this assertion. We believe, in fact, that a great deal of the root produced in the Netherlands Indies is offered for sale in a powdered form, and it may well be that the adoption of this system in Malaya will prove attractive to the trade.

Introduction of Cacao. The day has not yet arrived when we are in a position to recommend cacao planting in Malaya either on a plantation scale or as a small-holders' crop. The account of investigations at Serdang, together with notes on the cultivation of the tree and preparation of the beans for the market, which forms the subject of an article in this number, is, however, of great interest and introduces the possibility that this crop may at a future date be considered as an addition to Malayan agriculture. Before this decision is made, however, extended trials will be necessary, for too great a reliance should not be placed on the initial success of trees grown under conditions which possibly are difficult of duplication in other parts of the country.

As the authors point out, isolated trees are met with throughout the country; we remember some years ago seeing a number in the Pekan District of Pahang, and we received an enquiry from a Malay of that District regarding the harvesting and treatment of the beans. The Department has more recently initiated an

experiment on the Kuala Lumpur—Bentong road to test the possibilities of cultivating the crop under jungle shade. An investigation of the soil and other conditions under which isolated trees are growing in different parts of the country and the results of present plantings of the Department of Agriculture may reveal additional data as to the range of soils suitable and the conditions under which the crop may succeed. Even should this enquiry fail to point to definite conclusions, it may at least indicate the lines upon which future experiments should be laid down.

In this place we would reiterate our statement that the investigation described in this number should not be used as a basis for the immediate adoption of cacao planting as a commercial product in Malaya.

Original Articles.

FURTHER SELECTION EXPERIMENTS WITH *DERRIS MALACCENSIS*

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Introductory.

Attention was drawn in a previous paper (1) to the necessity for a close study of the two species of derris at present cultivated in Malaya, with the object of developing strains of plants with roots of high toxic content, thereby eliminating to a large extent the variability in quality of commercial consignments of root.

An account was given in the paper referred to above of some experiments carried out with *D. elliptica*. In the present paper the results of a parallel investigation with *D. malaccensis* will be described.

The varieties included at present in this species comprise the following:—

(a) *D. malaccensis* var. *sarawakensis*
(b) *D. malaccensis* (Tuba merah)
(c) *D. malaccensis* (Kinta type).

The first-named variety is sometimes referred to as *D. malaccensis*, Sarawak erect, on account of its erect habit of growth. The botanical nomenclature has, however, been adopted to conform with that used when describing the original selection experiments carried out with this species (2).

An account of the experimental work performed with each variety will now be given.

Outline of Experimental Work.

(a) *Derris malaccensis* var. *sarawakensis*.

During 1932 a small supply of planting material of the above variety was obtained from an estate in Johore. The cuttings were established in the Experimental Plantation, Kuala Lumpur. When the plants were 25 months old, sixteen plants were lifted at random, the "fine" or marketable roots bulked and analysed. The results of analysis, calculated on a moisture-free basis, were as follows:—

		ozs.
Average weight of air-dry marketable root per plant	...	3.0
		per cent.
Rotenone	...	3.70
Ether extract	...	29.70
Proportion of rotenone to ether extract	...	12.5

The plants were allowed to remain for a further seven months when a similar procedure was adopted, six plants being lifted. The following results were obtained on analysis.

		ozs.
Average weight of air-dry marketable root per plant	...	4.2
		per cent.
Rotenone	...	3.20
Ether extract	...	26.20
Proportion of rotenone to ether extract	...	12.2

Although the results for the sample drawn when the plants were 32 months old were not so favourable as those when 25 months, it was considered that the remaining plants had considerable possibilities as a source of high-grade material. Previous results showed that with an average of 26 per cent of ether extract there should be a proportion of plants with roots with an ether extract of about 30 per cent.

Cuttings were therefore taken and established both at Kuala Lumpur and at the Central Experiment Station, Serdang.

The soil in Kuala Lumpur is of the Hill Quartzite type and may be described as a sandy clay loam. The cuttings at Serdang were planted in the General Nursery, the plot chosen being one on which tobacco had been grown and which had been heavily manured during the cultivation of that crop. The soil was, therefore, in good heart when the cuttings were planted.

The plants were spaced approximately 3 feet apart in the rows with a similar distance between the rows.

When the plants were between 23 and 24 months old they were lifted. There were 94 plants at Kuala Lumpur and 81 at Serdang.

In harvesting, the whole of the root system of each plant was lifted. The stems of each plant were removed and reserved for the purpose of striking cuttings.

The roots were washed free from adhering soil and dried, and the "fine" or marketable roots separated and weighed. The moisture content of these roots was approximately 8 per cent.

Analysis was restricted to a determination of ether extract in view of the fact that the rotenone content of root of this variety of derris is too low to allow of its being sold on this basis. Subsequently, estimation of rotenone was carried out on six samples selected at random to obtain a further indication of the extent of the variation in the proportion of rotenone to ether extract for this variety.

The methods used were those described in a previous number of this Journal ([3]).

The weights of marketable roots for individual plants showed considerable variation. Thus in the case of the plants at Kuala Lumpur the weights varied from 12.20 to 1.20 ozs. with an average of 4.20 ozs.; at Serdang from 22.70 to 2.50 ozs. with an average of 8.15 ozs. In the latter case the higher yields can be accounted for by the better soil. Table I, in which the figures are divided into groups of 1 oz. of marketable roots, affords an indication of the frequency of variation.

Table I.

Derris malaccensis var. *sarawakensis*

Weights of Marketable Root from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 1 ounce.

Marketable Root (air-dry basis)	No. of Samples	
	Kuala Lumpur	Serdang
ounces		
23 - 22	—	2
22 - 21	—	—
21 - 20	—	—
20 - 19	—	—
19 - 18	—	1
18 - 17	—	1
17 - 16	—	—
16 - 15	—	—
15 - 14	—	2
14 - 13	—	2
13 - 12	1	2
12 - 11	1	4
11 - 10	—	4
10 - 9	1	8
9 - 8	2	12
8 - 7	5	6
7 - 6	5	6
6 - 5	10	12
5 - 4	18	7
4 - 3	21	10
3 - 2	15	2
2 - 1	15	—
Total	94	81

The figures for ether extract, calculated on a moisture-free basis, show a remarkably close similarity at the two places. Thus for the plants at Kuala Lumpur the figures vary from 29.39 to 20.10 per cent. with an average of 24.77 per cent.; those at Serdang from 28.13 to 19.65 per cent. with an average of 24.20 per cent. Table II in which the figures are divided into groups of 1 per cent. affords a better indication of the frequency of variation.

The results of the rotenone determinations, which are summarized in Table III, indicate a much wider range of variation than has been found previously with roots of this variety. The figures for the proportion of rotenone to ether extract tend, therefore, also to vary widely. They range from 16.8 to 10.5 per cent. with an average of 14.2 per cent.

Table II.

Derris malaccensis var. *sarawakensis*

Ether Extract of Marketable Roots from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
30 - 29	2	—	2
29 - 28	4	1	5
28 - 27	12	1	13
27 - 26	10	12	22
26 - 25	15	10	25
25 - 24	14	21	35
24 - 23	17	19	36
23 - 22	13	10	23
22 - 21	3	5	8
21 - 20	4	1	5
20 - 19	—	1	1
Total	94	81	175

Table III.

Derris malaccensis var. *sarawakensis*

Relationship between Rotenone Content and Ether Extract of Marketable Roots from Individual Plants at Kuala Lumpur and Serdang.

Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
	per cent.	per cent.	per cent.
K.L. 18 ...	4.49	29.14	15.4
K.L. 38 ...	4.22	27.30	15.5
K.L. 90 ...	4.37	27.11	16.1
S. 112 ...	4.37	26.00	16.8
S. 136 ...	2.56	24.37	10.5
S. 143 ...	2.87	26.83	10.7
		Average	14.2

It is proposed to establish the cuttings from the 7 plants with an ether extract in excess of 28 per cent. as individual clones, those from the 95 plants with an ether extract between 24 and 28 per cent. being randomized and planted as a mixed population. The cuttings from the plants with an ether extract below 24 per cent. will be discarded.

(b) *Derris malaccensis* (Tuba merah).

Stocks of this variety have been maintained for many years past in the Experimental Plantation, Kuala Lumpur. In the early part of 1932 cuttings were taken and a small plot established in the Plantation to have a supply of plants of known age.

When 25 months old ten plants were lifted at random and the "fine" or marketable roots bulked and analysed. The results of analysis, calculated on a moisture-free basis, were as follows:—

		ozs.
Average weight of air-dry marketable root per plant	...	2.2
		per cent.
Rotenone	...	1.50
Ether extract	...	21.40
Proportion of rotenone to ether extract	...	7.0

A further six plants were lifted and analysed when 33 months old with the following results.

		ozs.
Average weight of air-dry marketable root per plant	...	2.1
		per cent.
Rotenone	...	1.40
Ether extract	...	20.90
Proportion of rotenone to ether extract	...	6.5

The results of analysis of the roots at both ages are in good agreement.

Cuttings were taken and established both at Kuala Lumpur and at Serdang.

The plants were spaced approximately 3 feet apart with a similar distance between the rows.

When the plants were between 23 and 24 months old they were lifted. There were 18 plants at Kuala Lumpur and 30 at Serdang.

In regard to harvesting and preparation of the root a similar procedure was adopted to that described for *D. malaccensis* var. *sarawakensis*.

Determinations of ether extract were made in all cases. Estimation of rotenone was carried out on alternate samples with the object of obtaining a reliable indication of the extent of the variation in the proportion of rotenone to ether extract for this variety.

The methods used were those described in a previous number of this Journal ([3]).

The weights of marketable roots for individual plants showed considerable variation. Thus in the case of the plants at Kuala Lumpur the weights varied from 10.60 to 0.70 ozs. with an average of 4.10 ozs.; at Serdang from 15.50 to

1.10 ozs. with an average of 5.13 ozs. Table IV, in which the figures are divided into groups of 1 ounce of marketable roots, affords an indication of the frequency of variation.

Table IV.

Derris malaccensis (Tuba merah)

Weights of Marketable Roots from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 1 ounce.

Marketable Roots (air-dry basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
ounces			
Above 10 ...	1	2	3
10—9 ...	—	1	1
9—8 ...	—	2	2
8—7 ...	—	6	6
7—6 ...	2	1	3
6—5 ...	3	1	4
5—4 ...	3	2	5
4—3 ...	2	3	5
3—2 ...	4	3	7
2—1 ...	2	9	11
Below 1 ...	1	—	1
Total ...	18	30	48

The figures for ether extract, calculated on a moisture-free basis, show a close similarity at the two places. Thus for the plants at Kuala Lumpur the figures vary from 25.40 to 18.23 per cent. with an average of 22.40 per cent.; those at Serdang from 26.84 to 14.04 per cent. with an average of 21.97 per cent. The frequency of variation is illustrated in Table V in which the figures are divided into groups of 1 per cent.

The results for rotenone confirm those obtained previously in so far as a low figure for this constituent is concerned. Both sets of results are in good agreement. Thus for the plants at Kuala Lumpur the figures vary from 1.78 to 0.82 per cent. with an average of 1.31 per cent.; those at Serdang from 2.20 to 0.44 per cent. with an average of 1.27 per cent. Table VI, in which the figures are divided into groups of 0.5 per cent., affords an indication of the frequency of variation.

Table V.

Derris malaccensis (Tuba merah)

Ether Extract of Marketable Roots from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
ounces			
27 — 26 ...	—	3	3
26 — 25 ...	1	1	2
25 — 24 ...	1	3	4
24 — 23 ...	3	5	8
23 — 22 ...	7	6	13
22 — 21 ...	4	3	7
21 — 20 ...	1	2	3
20 — 19 ...	—	1	1
19 — 18 ...	1	3	4
18 — 17 ...	—	2	2
Below 17 ...	—	1	1
Total ...	18	30	48

Table VI.

Derris malaccensis (Tuba merah)

Rotenone Content of Marketable Roots from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 0.5 per cent.

Rotenone (moisture-free basis)	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
2.50 — 2.00 ...	—	1	1
2.00 — 1.50 ...	2	6	8
1.50 — 1.00 ...	4	5	9
1.00 — 0.50 ...	2	4	6
Below 0.50 ...	1	1	2
Total ...	9	17	26

Similarly, the figures for the proportion of rotenone to ether extract are low. In the case of the plants at Kuala Lumpur the figures vary from 7.4 to 1.4 per cent. with an average of 5.6 per cent.; those at Serdang from 11.3 to 2.0 per cent. with an average of 5.8 per cent. The figures are summarized in Table VII.

In making a selection for propagating purposes, cuttings from all plants in which the ether extract exceeds 20 per cent. on a moisture-free basis are being established as a mixed population. The figure of 20 per cent., which corresponds to approximately 18 per cent. on an air-dry basis, has been selected because 18 per cent. is the standard on which consignments of root in Singapore on an ether extract basis are usually offered.

Table VII.

Derris malaccensis (Tuba merah)

Proportion of Rotenone to Ether Extract in Marketable Roots from Individual Plants at Kuala Lumpur and Serdang arranged in Groups of 1 per cent.

Proportion of Rotenone to Ether Extract	No. of Samples		
	Kuala Lumpur	Serdang	Total
per cent.			
Above 10 ...	—	1	1
10—9 ...	—	1	1
9—8 ...	—	1	1
8—7 ...	1	2	3
7—6 ...	2	3	5
6—5 ...	1	2	3
5—4 ...	2	2	4
4—3 ...	2	—	2
3—2 ...	—	4	4
2—1 ...	1	1	2
Total ...	9	17	26

(c) *Derris malaccensis* (Kinta type)

Two further series of samples of this variety, which is characterized by a moderately high ether extract, but only a low rotenone content, have been obtained from Perak. Seventeen plants were selected from one holding near Jeram Mengkuang and ten from another holding near Malim Nawar. The results of analysis of the original series of samples of this variety also taken near Malim Nawar have already been reported in this Journal ([2]).

In both cases the plants were stated to be about 18 months old.

The methods of harvesting and preparation of the root were as previously described for the other two varieties of *D. malaccensis*.

In regard to analysis, determinations of rotenone and ether extract were carried out on all samples to obtain, as in the case of *D. malaccensis*, Tuba merah, a reliable indication of the variation existing between rotenone and ether extract in this variety.

The weights of marketable roots from individual plants varied considerably. The plants at Jeram Mengkuang varied from 11.10 to 1.00 ozs. with an average of 4.47 ozs., those at Malim Nawar from 8.80 to 2.70 ozs. with an average of 5.09 ozs. A summary of the figures is given in Table VIII.

The figures for ether extract, calculated on a moisture-free basis, show a close relationship for both places. Thus for the plants from Jeram Mengkuang the figures vary from 27.40 to 16.34 per cent. with an average of 22.58 per cent.; those from Malim Nawar from 25.90 to 9.83 per cent. with an average of 22.88 per cent. The lowest result for a sample from Malim Nawar, 9.83 per cent., is of interest in view of the fact that the yield of root was about the average, the weight being 5.80 ozs. compared with an average of 5.09 ozs. for the series of plants. The results are summarized in Table IX.

Table VIII.

Derris malaccensis (Kinta type)

Weights of Marketable Roots from Individual Plants at Jeram Mengkuang and Malim Nawar arranged in Groups of 1 ounce.

Marketable Roots (air-dry basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
ounces			
Above 10 ...	1	—	1
10—9 ...	1	—	1
9—8 ...	1	1	2
8—7 ...	1	2	3
7—6 ...	—	1	1
6—5 ...	1	1	2
5—4 ...	2	—	2
4—3 ...	3	1	4
3—2 ...	4	4	8
2—1 ...	2	—	2
Below 1 ...	1	—	1
Total ...	17	10	27

Table IX.

Derris malaccensis (Kinta type)

Ether Extract of Marketable Roots from Individual Plants at Jeram Mengkuang and Malim Nawar arranged in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
28 — 27 ...	2	—	2
27 — 26 ...	1	—	1
26 — 25 ...	1	3	4
25 — 24 ...	1	3	4
24 — 23 ...	2	2	4
23 — 22 ...	3	1	4
22 — 21 ...	3	—	3
21 — 20 ..	2	—	2
Below 20 ...	2	1	3
Total ...	17	10	27

The results for rotenone confirm those obtained previously in so far as a low proportion of this constituent is concerned. There is, however, one abnormal sample from Jeram Mengkuang in which the rotenone amounts to 3.09 per cent. Apart from this sample, the results for the others from both places are in good agreement. Thus, in the case of the remaining plants from Jeram Mengkuang the figures vary from 1.76 to 0.11 per cent. with an average of 0.83 per cent.; those from Malim Nawar from 1.28 to 0.31 per cent. with an average of 0.60 per cent. A summary of the results in which the figures are divided into groups of 0.5 per cent. is given in Table X.

Similarly, the figures for the proportion of rotenone to ether extract are low. Apart from the single abnormal sample referred to above, the figures for the remaining plants from Jeram Mengkuang vary from 8.6 to 0.4 per cent. with an average of 3.6 per cent.; those at Malim Nawar from 5.0 to 1.6 per cent. with an average of 2.7 per cent. A summary of the results for all samples is given in Table XI.

As regards a selection for propagating purposes a similar procedure has been adopted to that followed with Tuba merah. All plants in which the ether extract exceeds 20 per cent. on a moisture-free basis are being established as a mixed population.

Table X.

Derris malaccensis (Kinta type)

Rotenone Content of Marketable Roots from Individual Plants at Jeram Mengkuang and Malim Nawar arranged in Groups of 0.5 per cent.

Rotenone (moisture-free basis)	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
Above 2.00 ...	1*	—	1
2.00 — 1.50 ...	2	—	2
1.50 — 1.00 ...	4	1	5
1.00 — 0.50 ...	5	3	8
Below 0.50 ...	5	6	11
Total ...	17	10	27

* 3.09 per cent. for Sample No. 5 from Jeram Mengkuang.

Table XI.

Derris malaccensis (Kinta type)

Proportion of Rotenone to Ether Extract in Marketable Roots from Individual Plants at Jeram Mengkuang and Malim Nawar arranged in Groups of 1 per cent.

Proportion of Rotenone to Ether Extract	No. of Samples		
	Jeram Mengkuang	Malim Nawar	Total
per cent.			
Above 9 ...	1*	—	1
9 — 8 ...	1	—	1
8 — 7 ...	—	—	—
7 — 6 ...	2	—	2
6 — 5 ...	2	—	2
5 — 4 ...	1	1	2
4 — 3 ...	2	3	5
3 — 2 ...	4	2	6
2 — 1 ...	1	4	5
Below 1 ...	3	—	3
Total ...	17	10	27

* 13.6 per cent. for sample No. 5 from Jeram Mengkuang.

Table XII.

Summary of Results of Analysis of Marketable Roots of Different Varieties of *Derris malaccensis*.

Variety of *Derris malaccensis*	Location of Plants	No. of Samples Analysed	Rotenone (moisture-free basis)			Ether Extract (moisture-free basis)			Proportion of Rotenone to Ether Extract		
			Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
			per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Var. *sarawakensis*[1]	Kuala Lumpur	94	4.49	4.22	4.36	29.39	20.10	24.77	16.1	15.4	15.7
do.	Serdang	81	4.37	2.29	3.02	28.13	19.65	24.20	16.8	10.5	12.7
Tuba merah[2]	Kuala Lumpur	18	1.78	0.32	1.31	25.40	18.23	22.40	7.4	1.4	5.6
do.	Serdang	30	2.20	0.44	1.27	26.84	14.04	21.97	11.3	2.0	5.8
Kinta type	Jeram Mengkuang	17	3.09	0.11	0.96	27.40	16.34	22.58	13.6	0.4	4.2
do.	Malim Nawar	10	1.28	0.31	0.60	25.90	9.83	22.88	5.0	1.6	2.7

[1] The figures for rotenone and for the proportion of rotenone to ether extract are based on the results of three determinations in each case.

[2] The figures for rotenone and for the proportion of rotenone to ether extract are based on the results of nine determinations for Kuala Lumpur material and seventeen for Serdang material.

Summary.

The following observations are offered on the results of analysis which have been summarized in Table XII.

While wide variations exist in the rotenone content and ether extract of roots from the different varieties studied, the figures indicate the superiority of *D. malaccensis* var. *sarawakensis* in these respects.

As regards rotenone, the wide variations in the Serdang samples of this variety are of interest. Attention is being paid to this point in connexion with the clonal samples of root being selected there. A much greater proportion of the samples will be tested for rotenone in addition to ether extract than in previous series of analyses. This will enable the variation in the proportion of rotenone to ether extract for this variety to be determined with a much greater degree of accuracy.

While the figures for ether extract of Tuba merah and Kinta type are in close agreement, the results indicate a slightly higher proportion of rotenone in the former variety. Based on present commercial standards for sale of the roots this is of little or no consequence since, as stated previously, the rotenone content, even of the var. *sarawakensis*, is too low to admit of its being offered for sale on such a basis. At present, root of any of the three *D. malaccensis* varieties can be offered only on an ether extract basis. A much lower price is paid for root sold on this basis than for that sold on a rotenone basis, the latest Singapore figures being $16 per picul for root sold on an ether extract basis compared with $26 per picul for root sold on a rotenone basis.

In this connexion it must be pointed out that the present standards of rotenone and ether extract are arbitrary. As mentioned previously ([3]) correct comparative evaluations of toxicity of different species and varieties of derris can only be obtained as a result of controlled experiments with different classes of insects. Thus, it may well be that combined chemical and entomological research will reveal the suitability of even Kinta type as a specific against certain insects.

Stocks of high-grade plants from each variety are therefore being maintained to provide supplies of cuttings should the necessity arise.

In conclusion, attention might be drawn to two interesting features of the figures in regard to the effect of change of environment on toxicity and to the relationship between yield of root and toxicity. Reference has already been made in a previous paper ([4]) to the first of these two questions.

The comparatively close relationship between the respective figures for ether extract both of the var. *sarawakensis* and Tuba merah cultivated at Serdang and Kuala Lumpur, confirm the opinion expressed in the paper referred to above that toxicity of a mixed population of plants is not affected to any marked extent as a result of change in environment.

Further, although as a result of better soil conditions at Serdang the average yield of root per plant for var. *sarawakensis* is double that found at Kuala Lumpur the toxicities are of the same order in so far as ether extract is concerned. As explained previously, the figures for rotenone are insufficient to allow of any con-

clusion being drawn in respect of the influence of yield of root on this constituent. Further information on this point will be forthcoming, however, as a result of the study of inter- and intra-clonal variation in toxicity now in progress at Serdang.

Acknowledgments.

The writers wish to acknowledge the assistance of Mr. C. W. S. Hartley, Agricultural Officer, Perak South, and Mr. Ng Cheng Chong, Chinese Sub-Inspector of Agriculture, Kampar, in the conduct of this investigation.

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DERRIS ULIGINOSA

BY

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A short note on this derris may be of interest, since it is frequently referred to as a fish poison. Further, it has also been claimed useful as an insecticide (1). *Derris uliginosa* is a common shrub or climber, according to conditions, occurring on the banks of tidal rivers or mangrove swamps along the coast of Malaya. Since exact knowledge was lacking as to the value of its root for insecticidal purposes, several plants were cultivated at the Central Experiment Station, Serdang, in order to obtain information on this point.

It would appear that the correct name for this species is *Derris trifoliata*, Lour. (2), superseding the better-known name of *D. uliginosa*, Benth. Two Malay names are recorded, *ketui* and *setui*, (signifying the plant for a medicinal bathing of the feet) which, however, have no independent meaning (3). It is a slender plant with compound leaves composed of five (sometimes three) leaflets, which are leathery, dark green when mature, and hairless on both sides. The inflorescence is a numerous flowered erect raceme, with small white or pinkish flowers. The fruit is a flat, single seeded, almost circular pod. The flowers and fruit are illustrated in Ridley's Flora of the Malay Peninsula together with a description of the plant (4).

The plant grows readily from seed and thrives under ordinary cultural conditions on inland soils. It forms a low straggling shrub, unless support is available, when it climbs to a considerable height. When in flower this species presents a very ornamental appearance owing to the multitude of small white flowers emerging from the canopy of deep green foliage.

A sample of root, obtained from plants three years old grown at Serdang, was examined by the Chemical Division of the Department of Agriculture, and I am indebted to the Senior Chemist, S.S. and F.M.S., for the following results of analysis, calculated on a moisture-free basis:—

	per cent.
Rotenone	0.47
Ether extract	5.02
Proportion of rotenone to ether extract	9.40

The ether extract was tested for toxicarol with negative results.

It will be seen from the above figures that *D. uliginosa* produces root of insufficient toxicity to be of any commercial value.

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CACAO.

An Introductory Note

BY

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and
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As already recorded, a considerable degree of success has been obtained with a small scale trial with cacao at the Central Experiment Station, Serdang (1).

Isolated cacao trees are met with throughout the country and pods are frequently exhibited at Agricultural Shows, but so far this crop has not been grown commercially in Malaya. It is proposed in this article to record the preliminary results so far obtained with cacao at Serdang and to outline very briefly the salient points of its cultivation. It should be pointed out that cacao has proved a stubborn plant to grow in Malaya but as shown later, this appears to have been due to failure to appreciate an essential requirement, *i.e.* heavy shade in the initial stages. Once this was provided the cacao made surprisingly good growth, and where the soil is suitable it appears probable that with care this crop will succeed in Malaya. The yield of commercial cacao is a matter of a balance between the natural gross yield which is encouraged by a high and continuous humidity, and the loss from black-pod disease, which tends to be increased by the same factor. So far as can be yet judged the climate of Malaya should be excellent for cacao; but since this crop is subject to several fungus diseases and insect pests, only extensive trials can prove how well the crop will do here.

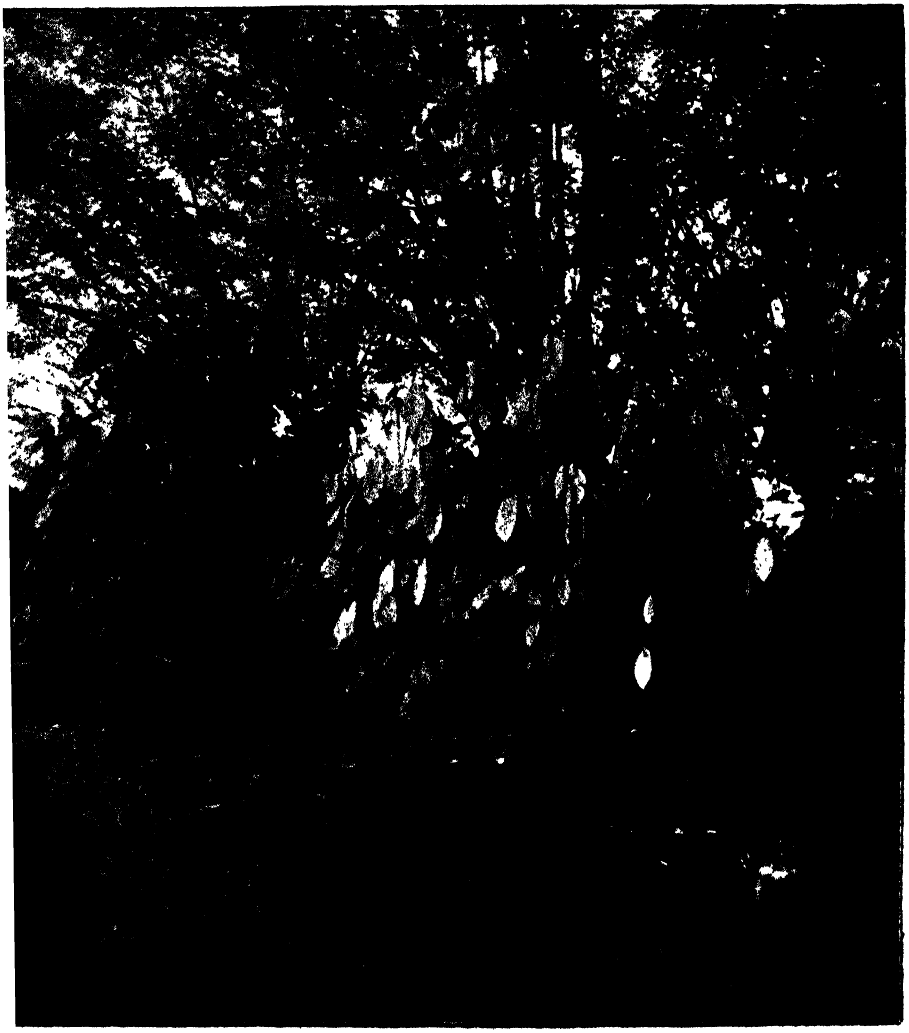
Early History in Malaya.

The early history of cacao planting in Malaya has been dealt with in some detail by Mr. I. H. Burkill in his Dictionary of the Economic Products of the Malay Peninsula (2) and there is no necessity to recapitulate this information here. It is sufficient to state that a number of experiment plantings, over a period of many years, were tried with no success. Mr. H. N. Ridley mentions that cacao was planted in the first Botanic Garden in Singapore in 1823 by Sir Stamford Raffles, but the experiment was not continued (3).

Previous Trials by the Department of Agriculture.

During recent years, several trials were conducted with this crop by the Department of Agriculture with disappointing results. A small planting of Forastero cacao, imported from Ceylon, was made at an elevation of about 2,000 feet, at

Cacao Tree No. 47, Showing Ripe Pods.



CACAO UNDER SHADE OF *Gliricidia Maculata*
AT CENTRAL EXPERIMENT STATION, SERDANG.

Gunong Angsi, in Negri Sembilan ([4]). The seedlings were planted in hill jungle, cleared of all undergrowth, and given careful attention. The plants failed, and it was evident from their behaviour that cultural conditions were quite unsuitable.

At the Central Experiment Station, Serdang, a number of experiments were undertaken, commencing in 1923. A variety of sites was selected, but in each instance either the degree of overhead shade, or cultural conditions, proved unsuitable, and the plants failed to thrive ([5]).

Present Experiment at Serdang.

During a visit to Beaumont Estate, Klang, the property of Mr. Goh Hock Huat, in November, 1933, a single cacao tree was observed growing vigorously and fruiting in profusion. The tree was situated on flat land consisting of a deep alluvial moist soil. Some shade was afforded by surrounding fruit trees. Mr. Goh Hock Huat kindly gave one of the writers seven pods from this tree and these were taken to Serdang, and a number of seedlings raised. It was stated that the tree was raised from seed originally imported from Ceylon. In order to provide a site for a further trial with cacao, a half-acre plot of land in the General Nursery was prepared for planting. Strong stumps of *Gliricidia maculata*, a leguminous shade tree, were planted throughout the area at a distance of 15 feet apart, triangular planting.

The pods contained on an average 27 seeds each and these were sown in baskets on the 14th November, 1933. The seedlings were transplanted in the half-acre plot on the 13th April, 1934, at equal distances between the shade trees, *i.e.* 15 feet apart triangular planting, requiring 108 seedlings for the plot. Soon after planting, rows of the leguminous shrub, *Crotalaria anagyroides*, were established from seed. The cacao seedlings were shaded with cut palm leaves in the first instance, but the Gliricidia trees and Crotalaria soon provided a light shade, when the palm fronds were removed. A few cacao plants died during the ensuing dry weather and the vacancies were supplied with seedlings raised from seed from two Forastero cacao pods obtained from Peradeniya, Ceylon.

The cacao trees made good growth and several reached the fruiting stage approximately three years from planting. During this period the overhead shade was encouraged by judicious pruning to form a complete canopy over the cacao. The accompanying illustration shows the denseness of shade afforded. Considerable trouble was experienced from a small chafer beetle, (*Apogonia cribricollis*, Burm.) which devoured the young leaves of the cacao and became a serious pest. Some success was obtained by spraying the trees weekly with a solution of lead arsenate (1 oz. lead arsenate in four gallons of water), but during wet weather the chafer continued to feed on the leaves. In 1935, a small application of calcium cyanamide (2 ozs. per tree) was dug below the soil and this appeared to have the immediate effect of reducing the depredations of the chafer. A second application was made in 1936, since when the trees have been fairly immune from the chafer pest.

Table I.

CACAO—4 Years old from Seed.

Individual Tree Crop Records, March—November, 1937.

(108 Trees of which 39 have fruited *i.e.* 36 per cent.)

Tree No.	No. of Pods.	Total Weight Pods.	Weight per Pod.	Weight Wet Cocoa per Tree.	Weight† Dry Cocoa per Tree.	Weight† Dry Cocoa per Pod.	Average No. of Beans per Pod.	Weight† of 100 Dry Beans
		lbs.	lbs.	lbs.	lbs.	oz.		oz.
3	6	4.72	0.79	1.12	0.45	1.20	32.3	3.72
4	12	11.06	0.92	2.19	0.88	1.17	26.2	4.46
8	6	3.27	0.54	1.02	0.41	1.08	31.2	3.46
10	4	3.01	0.75	0.77	0.31	1.22	34.0	3.59
14	1	0.72	0.72	0.14	0.06	0.90	32.0	2.81
21	26	25.25	0.97	4.07	1.63	1.00	33.0	3.03
22	9	6.09	0.68	1.55	0.62	1.10	29.4	3.74
24	7	7.68	1.10	1.50	0.60	1.37	32.9	4.17
25	4	2.02	0.50	0.52	0.21	0.82	28.0	2.93
27	19	19.19	1.01	3.64	1.46	1.22	28.3	4.31
28	19	10.03	0.53	2.16	0.86	0.73	28.6	2.55
30	1	1.03	1.03	0.22	0.09	1.40	35.0	4.00
31	2	1.52	0.76	0.23	0.09	0.75	32.0	2.34
32	13	7.68	0.59	1.41	0.56	0.69	31.4	2.20
33	28	24.41	0.87	2.70	1.08	0.62	28.1	2.21
35	10	10.07	1.01	1.59	0.64	1.01	29.0	3.48
38	26	20.06	0.77	3.47	1.39	0.85	21.4	3.97
40	4	4.00	1.00	0.75	0.30	1.20	24.2	4.96
41	31	35.15	1.13	5.87	2.37	1.21	26.0	4.66
44	24	17.98	0.75	3.59	1.44	0.96	24.8	3.87
47	16	15.11	0.94	2.89	1.16	1.16	27.5	4.22
48	23	26.21	1.14	3.16	1.26	0.88	26.7	3.30
49	2	1.72	0.86	0.28	0.11	0.90	22.0	4.09
50	45	29.66	0.66	3.44	1.38	0.49	21.3	2.30
53	25	17.81	0.71	2.73	1.09	0.70	31.8	2.20
55	1	1.19	1.19	0.19	0.08	1.20	27.0	4.45
57	36	31.55	0.88	5.37	2.15	0.96	29.7	3.23
63	25	20.22	0.81	3.08	1.22	0.78	25.4	3.70
68	61	39.14	0.64	6.29	2.52	0.66	27.2	2.43
69	1	0.78	0.78	0.11	0.04	0.70	25.0	2.80
72	5	4.05	0.81	0.41	0.16	0.52	22.2	2.34
75	1	1.00	1.00	0.22	0.09	1.40	30.0	4.67
77	36	29.10	0.81	5.05	2.02	0.89	30.0	2.97
79	1	0.97	0.97	0.16	0.06	1.00	28.0	3.57
83	9	7.51	0.84	1.42	0.57	1.01	29.6	3.41
86	4	2.62	0.65	0.56	0.22	0.90	32.2	2.80
90	4	3.62	0.90	0.59	0.24	0.95	32.2	2.95
94	1	0.91	0.91	0.12	0.05	0.80	22.0	3.64
103	1	0.81	0.81	0.16	0.06	1.00	20.0	5.00
Totals	549	448.92	32.73	74.74	29.93	37.40	1097.6	133.90
Means	14.1	11.51	0.84	1.92	0.77	0.96	28.1	3.43
West African Averages*	25	21.5	0.86	5.4	2.15	1.4	33.0	4.17

† Calculated from wet weights on the assumption that dry weight is 40 per cent. of wet weight; this factor is known to be very constant from tree to tree.

* These West African figures refer to adult trees in full bearing.

Table I records the crop harvested, together with other relevant data, from 39 trees out of a total of 108 which fruited during the period March-November, 1937. These records are of an entirely preliminary nature since only 36 per cent. of the stand of trees has so far fruited and all are much too young for their relative cropping capabilites to be judged with confidence.

It is of interest to record some ordinary standard figures for Nigerian cacao, based on data obtained by the Department of Agriculture of that country.

About 860 lbs. dry cacao per acre.

100 main-crop pods weigh about 86 lbs.

100 main-crop pods yield about 8.6 lbs. dry cacao.

300 beans main-crop weigh about 12½ ozs.

300 beans mid-crop weigh about 9½ ozs.

On the average, 11½ main-crop pods yield 1 lb. dry cacao.

It appears that the cacao established at Serdang is the Forastero variety with forms ranging from typical Forastero to "Amelonado" and "Calabacillo" types, as commonly grown for commercial purposes in the chief cacao-producing countries. The average height of the trees, measured in November, 1937, was 9 feet. Although all the trees which are as yet in bearing are the progeny of the single cacao tree at Klang, already described, there is considerable variation in the fruits. The selection from this or other material for further planting will require special study, since the bean is the product marketed, and specialized knowledge is necessary before progress in this direction may usefully be made. The parent tree at Beaumont Estate, Klang, has unfortunately died since the pods were collected from it in 1933. The illustration shows a typical tree (No. 47) with pods of good size.

General Considerations.

In view of the preliminary success obtained it is proposed to commence extended trials with cacao both at Agricultural Stations and at the Central Experiment Station, Serdang. At the latter Station, arrangements are in hand to plant 10 acres during 1938.

A limited number of seeds and seedlings are available from Serdang. As already shown, crop records from individual trees are kept which will permit some initial selection of planting material.

Since the preparation of cacao beans for market is a simple process, the cultivation of this crop is considered a possible small-scale industry for Malaya.

Cultivation and other Notes.

There are a number of text books dealing with this crop, the most pretentious being that by Van Hall (6). Cacao is grown to some extent both in Ceylon and Java, and cultural information from these countries is likely to be of the greatest value here.

Soil and Situation.—The cacao tree develops a long tap-root, and requires a deep fertile soil such as is found in valleys and undulating land adjoining rivers. Good specimens have been seen growing on granite soil adjoining the foot-hills

of the main mountain range in Malaya. In Ceylon and Java, the cacao-growing districts occur principally at elevations between 500 and 2,000 feet.

In Trinidad, recent investigations show that the best cacao soils are almost neutral (pH 7.0) or slightly alkaline, and it is considered that most of the soils of that country would benefit by liming (7). The African cacao soils are, however, more acid, having a pH of about 5.5. Where the cacao is growing at Serdang the soil is still more acid (pH 4.6).

Planting Distance.—It is considered that a planting distance of 12 feet by 12 feet, triangular spacing, providing a stand of 350 trees per acre, may safely be employed under Malayan conditions.

Propagation.—Cacao plants are normally raised from seeds, which germinate within three weeks and form strong plants in baskets ready for transplanting in four to five months from sowing. A deep basket is advisable since the seedlings make rapid growth and form a long tap-root. Vegetative propagation is under investigation in many cacao-growing countries, and in view of the necessity for selection, is likely to receive considerable attention. The vegetative propagation of cacao and present position of botanical researches on this crop have recently been dealt with in some detail by Prof. Cheesemen of Trinidad, B.W.I. (8 & 9).

Shade.—The thornless "dadap" (*Erythrina lithosperma*) and allied species are commonly used in Ceylon as overhead shade, but at Serdang have proved useless owing to damage from boring caterpillars. A suitable tree is *Gliricidia maculata*, and this leguminous tree is recommended for local use owing to its freedom from insect attack and general adaptability. Further investigations may show other trees to be suitable for the purpose. The trees at Serdang, as already mentioned, are interplanted in equal numbers with the cacao. Although the trees have been severely pruned the shade is now becoming too dense. With close planting, cacao forms a complete canopy after four or five years and it is probable that, in Malaya, overhead shade may then be dispensed with.

The cacao plot at Serdang is surrounded on two sides by a dense bamboo hedge resulting in a high degree of humidity and protection from winds. It is evident that the shade and humid conditions are mainly responsible for the success so far obtained.

Yields.—These vary considerably in different countries according to the variety of the cacao grown and other factors. Whereas in Trinidad the average yield is stated to be 260 lbs. cured beans per acre, in Nigeria it is estimated to be three or four times this figure. The low yield in the former instance is largely due to trees becoming old and less prolific, whereas in West Africa the trees are considerably younger and more thickly planted.

In Ceylon, a good average yield from mature areas is considered to be 4 to 5 cwts. Cacao reaches full bearing after about seven years and may continue in production until eighty or more years old. The yield per acre generally begins to fall after about thirty years, but whether this need occur if the trees are properly cared for is still a debatable question. An average of twelve pods to one pound of cacao is the accepted standard in Trinidad, but size of pods and proportion

of beans to pods are variable factors. The size of bean is an important commercial character. Thus the West African main crop cacao, with 23 or 24 beans to the ounce realizes a very considerable premium over the off-season production with 30 to 32 beans to the ounce.

Harvesting.—This should be carried out once a month whenever there is any crop on the trees. Any considerable delay in harvesting results in much loss from black-pod disease and from the beans germinating in the pod. In harvesting it is undesirable to pick obviously green and unripe pods, because the presence of a very large proportion of such cocoa makes satisfactory fermentation impossible; but it is better to pick all pods that are nearly ripe, than to err in the other direction, for nearly ripe beans, fermented in a mixture with ripe ones, yield a satisfactory product, while ripe cocoa left on the trees may be damaged or germinated before the next round. The pods are generally split in the field, the shells left there and only the wet beans carried to the store. It is good practice to bury the shells, although investigations in several countries have failed to prove any definite connexion between heaps of shell left in the field and the spread of pod disease.

Preparation.—This consists of fermenting and drying. During the fermentation process the bitter and astringent taste of the raw bean largely disappears and the "cocoa" or "chocolate" flavour develops. When dry, a cut fermented bean is brown in colour and friable in texture, whereas a cut unfermented bean is either slaty both in colour and texture, or purple in shade and cheese-like in texture. The fermentation of the raw bean is an essential process in the preparation of a good commercial product, and numerous attempts to replace it by more artificial processes have failed to give satisfactory results. The process is not inconvenient to the grower for it shortens the time taken in drying. With ordinary Forastero cocoa the period of fermentation, if the cocoa is intended for sale in England or America, should be not less than six nor more than seven days. This period of fermentation produces a bean that is light brown when cut and not very brittle. The continental manufacturer generally prefers, in Forastero cocoa, a very dark and brittle bean, such as is produced by nine days' fermentation—a type of bean which is disliked by all English manufacturers. The fermentation can be carried out in any form of basket, box or wooden-sided tank, according to the quantity to be handled, though it is hardly possible to prepare a first-quality product in quantities of less than about 40 lbs. (dry weight). The cocoa should be well covered with banana leaves or old sacking to assist the retention of the heat of fermentation. One turning-out and mixing of the cocoa during fermentation is essential, and two are preferable. The first mixing should be done not less than 60 hours, after the beginning of the process. If a second turning is given it should not be carried out until a further period of about 48 hours has elapsed. In the mixing process the cocoa must be turned out of the box or basket and refilled into it or into a similar one: a sufficiently good mixing cannot be obtained by stirring. Failure to turn and mix adequately will result in a proportion of mouldy beans.

After fermentation, the beans are sun-dried on a cement barbecue or on a tray or mat. In this process the beans should be spread in a layer not more than about two or at the most three inches thick. During the first two days' drying the beans should be stirred or turned several times. Provision must be made for covering the cocoa at night or during rain without heaping it or bagging it, for until it has been dried for one or two days it cannot be bulked for more than a very short time indeed without becoming infected with moulds. If the fermenting and drying processes are properly carried out, the cocoa, once it is thoroughly dry, can be kept for quite considerable periods in even somewhat humid conditions without deteriorating. If it is once infected with mould during fermentation or drying, it can hardly be prevented from rapid deterioration during storage and transit. During the process of fermenting and drying there is a loss of weight of 58 to 60 per cent. Before the cocoa is bagged for sale any black beans (*i.e.* beans from pods badly damaged by black-pod disease) should be removed, together with any germinated beans and any completely flat undeveloped ones, and any pieces of " placenta".

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CACAO, COCOA AND COCA AND ALLIED WORDS.

There is sometimes confusion between these names, and we have heard of a planter (not in Malaya) who introduced and planted an area of coca under the impression that it was the plant from which a beverage is obtained.

Cacao, cocoa, coco, and the now obsolete cocao, are synonymous for the plant *Theobroma cacao*, from the seeds of which cocoa and chocolate are prepared. The term cocoa (according to the Oxford Dictionary) originated, apparently by accident, in Dr. Johnson's Dictionary.

The use of the spelling cacao in relation to the tree, if slightly pedantic, is at least correct, since it is part of the botanical name of the tree. To use this spelling for the prepared product, which is always spoken of as cocoa, is the extreme of pedantry.

Coca is a plant, *Erythroxylon coca*, the dried leaves of which, with powdered lime, are chewed to appease hunger and to stimulate the nervous system. It is illegal to plant *Erythroxylon coca* in Malaya.

The coconut, cocoanut or cokernut is the fruit of the coconut palm (*Cocos nucifera*).

The tuber of an Aracerous plant, *Colocasia esententa* or taro-plant is cultivated in many tropical countries as an article of food, and is known as kĕladi in Malaya. Coco-yam is a common name for the same plant.

Ed. M.A.J.

Miscellaneous.

USE OF CRUDE OIL TO PREVENT DAMAGE BY CRABS.

For the development of an area of land which is inundated by brackish water at every spring tide, it is necessary to build a bund along the river edge. Land of this nature situated at the mouth of the Perak River has been opened up by the writer.

The building of the bund was done by digging a shallow drain or "key" 1 foot deep and 12 feet wide, thereafter earth being carried from a drain dug at a distance of 120 feet away and parallel with the bund. The latter was built to a height of of 5 feet.

The land was riddled by crab holes and as something had to be done to combat the crabs several poisons were tried with negative results. Finally ordinary crude oil was tried and it was found that when a small quantity of this was poured into a hole, there was no recurrence of mud being pushed up from underneath. The writer in unable to state whether the dredger crabs are killed or simply deterred by the oil.

It may not be generally known, except by those who have experience of crab land, that the holes are made and the mud pushed up from a depth of several feet by the 'dredger crabs' or 'udang getah'. The land crabs thereafter take possession and use the holes as hiding places.

On the shallow drain being dug for the bund, to each hole—these were every foot or two apart—was applied half a cigarette tin of crude oil. The surface of the drain was sprayed with the oil and then the bund built. The oiling was done each day as the bund work proceeded.

From the point of view of building this bund the experiment was entirely successful. If the contractor omitted to put down the oil as instructed (incidentally he did do so on one occasion and had to remake the whole of his previous day's work) the following day the new bund would be riddled with holes, but properly carried out, only an occasional hole appeared.

After the bund had been completed, a labourer was sent round one day each month to put oil into and seal with mud, any hole which appeared. These sealed holes never seemed to be opened up again. For this upkeep work about 8 gallons of oil sufficed for about 60 chains of bund per month.

P. C. Fisher.

Abstract.

THE EXPORT CROPS OF THE NETHERLANDS INDIES IN 1936.

Bulletin No. 149 of the Central Bureau of Statisticis of the Netherlands Indies.

The year 1936 was a turning point for the Netherlands Indies in respect of the total value of its exports and of the value of the exports of agricultural products, which rose to a total of Gs. 362 millions from a total of Gs. 294 millions in 1935. The quantities exported were respectively 3,281,000 and 3,275,000 metric tons* and the average values per ton respectively Gs. 110 and Gs. 90.

Of the total value of the 1936 exports of agricultural products 63.3 per cent. was estate produce and 36.7 per cent. native produce. For the last 12 years this proportion has been fairly stable.

Expressed as a percentage of total world exports of important agricultural products the 1936 exports from the Netherlands Indies were: cinchona 90 per cent., kapok 77 per cent., pepper 92 per cent., rubber 36 per cent., copra 27 per cent., agave-fibre (sisal) 22 per cent., tea 18 per cent., oil palm products 17 per cent.

Cane Sugar.

The area planted with pedigree cane to serve as planting material was 7,250 hectares† and the crop from 1,787 hectares of this area had to be milled. This compares favourably with the 1935 figures of respectively 4,568 and 1,820 hectares. Total production of cane sugar was 574,710 tons and total exports 880,515 tons, further reducing old stocks. Cane sugar production for the year 1936-37 is estimated to be 6.6 per cent. of the world's total cane-sugar production; for 1934-35 it was at its lowest point at 3.1 per cent.

Native production for home consumption increased slightly, the planted area being 12,909 hectares as against 11,507 hectares in 1935.

Rubber.

The estate planted area was 595,959 hectares, 537,376 hectares of which were in bearing. A total area of 12,619 hectares of old rubber was cut down, and 13,086 hectares were planted with superior material. Of the total area planted, 157,449 hectares (26.4 per cent.) are budded rubber, fully 90 per cent. of which was planted before 1934.

The extent of the native-owned planted area has now been approximately determined. For Java the only figure given is one of nearly 8 million trees, 60 per cent. of which is tappable. For the Outer Provinces the figures are: 788,438 owners, a total of 582,365,725 trees, of which 232,374,010 are being tapped and 209,343,934 are tappable but not yet tapped, whilst 140,647,781 trees are not

* Throughout this abstract, "ton" refers to the metric ton of 2,200 lbs.

† 1 hectare = 2,472 acres.

tappable. The total planted area is estimated at 681,187 hectares, of which 629,983 are tappable and 51,154 not tappable. The tappable area itself is sub-divided into five classes:—

I Good	IIa Fairly Good	IIb Fairly Bad	III Bad	IV Neglected
		(in hectares)		
27,327	111,919	253,630	135,380	101,717
		(per cent.)		
4.3	17.8	40.3	21.5	16.1

The registration figures probably are somewhat on the low side and liable to correction in the course of 1937.

After the revision in 1936 the total basic production quota (in metric tons) for the Netherlands Indies was fixed at:—

1934	1935	1936	1937	1938
357,632	406,400	508,000	528,320	548,640

of which were allotted to estates and to natives respectively:—

208,532	236,968	262,442	276,660	287,324
149,100	169,432	245,558	251,660	261,316

Total exports in 1936 were (in metric tons):—

Estates	Native	Total
163,983	151,626	315,609

against allowances of:—

164,026	153,474	317,500

The quality of the native product exported further greatly improved. Whereas before the introduction of restriction the figures for first, second and third quality were respectively about 16½, 3 and 80½ per cent., those for 1936 were respectively: 84.6, 0.3 and 15.1 per cent. The output of the remilling factories has correspondingly increased steadily from 11,384 tons in 1932 to 53,616 tons in 1936.

Coffee.

The planted estate area was 112,696 hectares, 82½ per cent. of which is in Java, and the area of native plantations in Java was 23,807 hectares; the area of the native plantations in the Outer Provinces is not known. Estate production was 50,383 tons and the export of native-grown coffee from the Outer Provinces was 74,530 tons, 91 per cent. of which came from Sumatra. The bulk of the production is Robusta coffee.

Tea.

The planted estate area was 138,750 hectares, 76 per cent. of which is in Java, and over 98 per cent. in bearing. No native tea is grown outside Java. In Java the planted native area was 66,243 hectares, 97 per cent. of which was in bearing. The total quantity of estate produce, including 12,629 tons dry weight of purchased native-grown leaf, representing a value of Gs. 3,291,931, was 75,581 tons.

Tobacco.

The particular features of this cultivation and of the preparation for export were fully described in Volume XXII (1934) of this Journal.

The crop of the superior grade of leaf for cigar wrappers, which is confined to estate cultivation on the East Coast of Sumatra, amounted to 13,712 tons. In Java and Madura, estate cultivation of cheaper grades and of European-managed curing of purchased native-grown leaf produced a crop of 14,726 tons of "leaf tobacco" and of 17,124 tons of crude tobacco.

Further there is a large native output for home consumption and its export surpluses in 1936 were 17,141 tons for Java and 1,288 tons for the Outer Provinces.

Cinchona.

The 1936 estate production of dried cinchona bark was 9,879 tons. Export of native-grown bark was 99 tons dry weight, and the Bandoeng quinine factory further purchased nearly 11 tons dry weight of native-grown bark of an average percentage of 4.92, and a quinine equivalent of 524 kilograms. Native cultivation is increasing.

Oil Palm Products.

Of a total planted area of 79,318 hectares, 67,885 hectares are in bearing. Production amounted to 175,236 tons of oil (palm oil and kernel oil together) and 36,135 tons of kernels. Exports were respectively 172,366 and 36,802 tons. Of the total area 94 per cent. is in North Sumatra, where the yield of palm oil per hectare in bearing is now 2,630 kilograms.

The Netherlands Indies in 1936 contributed 36.7 per cent. to the world's exports of palm oil and 4.85 per cent. of kernels.

Coconuts.

The estate area in bearing is: Java 6,018 hectares and Outer Provinces 31,664 hectares, together producing 29,578 tons copra equivalent. In addition to this, native-grown produce was bought equivalent to 722 tons of copra. Total estate production was 30,300 tons.

Though native production in Java and Madura is large, domestic consumption in 1936 required an import surplus of 26,875 tons copra-equivalent. Native coconut-growing in Java and Madura is estimated to have produced 153,900 tons of copra for the local oil mills. This figures does not include domestic consumption of nuts tor culinary purposes and for oil extraction in the small native village oil mills.

The export surplus from the Outer Provinces in 1936 was 504,278 tons, including 26,234 tons estate produce.

The total 1936 export of copra, oil and coconuts combined from the Netherlands Indies amounted to 518,491 tons copra equivalent.*

Essential Oils.

The estate area planted with citronella was 7,038 hectares of which 6,517 hectares were in bearing. The native area in Java is stated to have been 14,451 hectares, of which 13,107 hectares were in bearing. A large total of small scattered native fields, the produce of which is distilled in the villages, always remains outside official statistics; exports of oil always greatly exceed the known production. For 1936 the figures were respectively 1,603,003 and 569,605 kilograms.

Exports of other essential oils in 1936 were (in kilograms):—cajeput oil 56,021, vetiver oil 16,300, patchouli oil 13,358.

Hard-Rope Fibres.

Chiefly sisal, grown on estates. The total export in 1936—not including refuse—was 76,627 tons, compared with 92,346 tons in 1935.

Kapok.

This crop is almost entirely native-grown and the cleaning of the fibre from the pod is largely a village industry. The bulk of the exports come from Java. Total 1936 exports were:—

Fibre	Seeds	Oil	Oilcake
	(in metric tons)		
28,439	21,702	2,981	23,529
of which estate produce was:—			
2,561	4,859	—	—

Only *Ceiba pentandra* L. Gaertn. is cultivated.

Pepper.

Cultivation is almost entirely in the hands of native and Chinese growers. The 1936 exports were:—

	Black	White	Total
		(in metric tons)	
Sumatra ...	58,620	1,606	60,226
Banka and Billiton ...	932	13,036	13,968
Borneo ...	134	3,254	3,388
	58,686	17,896	77,582

* Basis of conversion: see *Malayan Agricultural Journal* Vol. XXV (1937) No. 2, p. 72.

as against a total of 60,631 tons in 1935. As in former years black pepper accounts for the bulk of the increase.

Tapioca.

This crop is almost exclusively grown by natives in Java for home consumption and only a small surplus is available for export in its various forms.

In 1936 the planted native area of 870,000 hectares as well as the harvested crop of 7,481,000 tons of fresh tubers considerably exceeded the 1931-1935 averages of respectively 733,400 hectares and 6,020,200 tons of tubers. Owing to this a surplus of about 849,000 tons of tubers was available for export, equivalent to 11.35 per cent. of the crop instead of the 1931-1935 average of 7.75 per cent.

To the figures for planted area and production those relating to estate cultivation for flour manufacture have to be added, but they are relatively insignificant.

The exports of tapioca products in 1936 were: dried tubers 46,237 tons; dried and ground 61,697 tons; flour 158,359 tons; flake and siftings 6,689 tons; pearl and seeds 12,461 tons; fibre residue 4,169 tons.

Coca.

This is exclusively an estate crop and is exported as leaf. Production in 1936 was 143,048 kgs. of leaf.

Gambier.

This crop is mostly native grown in the Outer Provinces which in 1936 exported 13,505 tons, 5,586 tons of which were consumed in Java. Estate production is stated to have been 3,379 tons.

Arecanuts.

This is entirely a native crop. In 1936 exports from Java were 6,718 tons and from the Outer Provinces 47,067 tons, total 53,785 tons.

Nutmegs.

No reliable figures for planted area, production and home consumption are available. The 1936 exports were: shelled nuts 2,078 tons, unshelled nuts 2,114 tons and mace 665 tons; they came chiefly from the Banda Islands group *via* Menado in Northern Celebes.

Cloves.

Production in the Netherlands Indies in 1936 was more than two and a half times the fairly steady average of 1932-35, and exports from the producing regions rose to 1,659 tons, of which, however, only 396 tons went to foreign countries. Java took 1,058 tons and in addition to this another 5,116 tons from foreign countries, chiefly Zanzibar.

Rice.

Java has always had an import surplus of rice in spite of its own huge production, but in 1936 with a record crop of 3,992,690 tons of husked rice from a record planted area of 3,873,000 hectares it has for the first time had an export surplus of 96,200 tons, most of which went to the Outer Provinces.

The Outer Provinces in 1936 had a net import surplus of 306,044 tons of husked rice, so that the net import surplus of the whole of the Netherlands Indies in 1936 was 209,844 tons for a population of over 60 millions. Bali, Lombok and Celebes always have a surplus available for export to other parts of the Outer Provinces.

Maize.

Though a native crop, formerly practically entirely for home consumption, exports to foreign countries from Java as well as from the Outer Provinces are increasing.

Of Java's 1936 crop of 2,220,300 tons of husked grain from a planted area of 2,229,000 hectares, 134,178 tons were exported to foreign countries as against 62,697 tons in 1935.

The Outer Provinces in 1936 exported 39,152 tons to foreign countries as against 20,584 tons in 1935. Practically all of this came from Celebes.

Groundnuts.

Exports to foreign countries in 1936 amounted to 47,035 tons from Java and to 3,134 tons from the Outer Provinces.

Soya Beans.

In 1936 Java for the first time had an export surplus of 3,756 tons. The 1936 crop was 247,400 tons as against 202,700 tons in 1935. In 5 years the Java production has been doubled. In the Outer Provinces, too, production is increasing and imports from foreign countries decreasing.

Total imports from foreign countries into the Netherlands Indies in 1936 were 5 per cent. of the imports in 1932.

Sago.

In 1936 exports to foreign countries were 47,028 tons mainly from the East Coast of Sumatra and Rhio Islands.

Derris.

Increased domestic consumption is thought to account for the decrease in the exports which in 1936 were 177 tons of dried roots against 818 tons in 1935. The planted estate area in 1936 was 1,070 hectares of which 318 hectares were in bearing.

Miscellaneous Crops.

The 1936 exports of a number of minor crops were as follows:—

	Tons	
Cocoa	1,657	
Cinnamon	2,742	
Castor Oil Seed	4,278	
Sesamum (dry seed)	2,341	
Candlenuts	170	
Potatoes	3,703	
Chillies	1,992	
Onions	1,770	
Vanilla	16,421	(kilograms)
Benzoin Gum	2,035	
Fresh Vegetables	8,454	
Dried Vegetables	2,992	
Fresh Fruit	7,387	
Tamarind	3,620	
Canned Fruits	301	
Kratok (dry seed)	2,937	
Cubebs	135	

L. A. J. R.

Review.

A Note-Book of Tropical Agriculture.

By R. Cecil Wood, M.A., Dip. Agric. Cantab. Published by the Imperial College of Tropical Agriculture, Trinidad, British West Indies, 2nd edition, 1937. 147 pp. Price 5 shillings post free.

This book consists principally of a compilation of facts and figures relating to tropical agriculture. The first edition, which was published early in 1933, has been exhausted and opportunity has been taken in printing the second edition to make a few alterations in the text. The author, Professor R. C. Wood was formerly in the Indian Agricultural Service and is now Professor of Agriculture at the Imperial College of Tropical Agriculture, Trinidad.

The first five sections of the book deal with Weights and Measures, Mensuration and Surveying, Buildings and Roads, Machinery, and Labour. The next three sections are allotted to Soils, Manures, and Crops, followed by other sections on Foods and Feeding, Livestock and Dairying. A section is devoted to Recipes, while the last few pages of the book are taken up by formulae for working out statistical analyses.

A feature of the publication is that the text is interleaved with blank pages for the purpose of making additional notes when desired.

This is an extremely useful little book and should form a handy reference for all those connected with tropical agriculture.

B. B.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

December, 1937.

The Weather.

The rainfall approximated to normal for the month in Kedah, but was below average throughout Province Wellesley, Perak and the inland areas of Selangor and Pahang. Precipitation was normal for the month in Negri Sembilan but was appreciably higher than usual in Malacca, on the coast of Klang and Kuala Langat in Selangor and at Pontian on the west coast of Johore The Bernam peninsula of Selangor did not share in this heavier coastal rainfall, the precipitation there being lower than usual for December.

The month was a very wet one throughout Kelantan, especially during the first week, and total rainfall figures for the month are considerably above average at all stations from which records were received.

Remarks on Crops.

Rubber.—There was a slight rise in price of the commodity at the beginning of the month which appears to have been maintained in some places but not in others. A general quotation given for smoked sheet is $30 a picul.

There was a general increase in the price offered for coupons as compared with the previous month with a corresponding decrease in the price for rubber not covered by coupons. Some of the quotations for coupons per picul equivalent are:— Penang, $13 as compared with $6 for November; Perak North, $15.80 as compared with $12.80; Perak South, $15 to $18 as compared with $10; South Johore, $10.50 to $20 as compared with $6.35 to $11.

It is recorded that in Kuala Selangor, cabinet-smoked rubber is commanding 80 cents more a picul than is paid for rubber smoked in dealers' or other large smoke houses.

Padi.—Harvesting has commenced in Kedah in some areas and the yields being obtained tend to confirm the fears previously expressed that the crop will be appreciably lighter than that of last season. Prospects are similarly not very bright for Province Wellesley.

Reports from Krian state that the appearance of the crop has improved considerably and that there is some likelihood of yields in the north-west of the District approximating to those of last season. Similar improvement is noted also as regards the crop in other parts of the District, but planting was generally late

and past experience of late planted padi in this District rather tends to induce a somewhat less optimistic view of the situation than is given in the December report from this Circle. In North and Central Perak a fair average crop is anticipated. In the Sungei Manik area of Perak prospects remain good for Stage I but rather less promising for Stage II.

In Selangor, transplanting is still in progress in the Panchang Bedena and Tanjong Karang areas. Harvest will consequently be very late. Satisfactory yields are being obtained generally in Pahang. In Kelantan, a better harvest is expected from the wet padi than for last season. The dry padi has also grown better than last year and is expected to produce better yields than last season. It is estimated, however, that the planted acreage of dry padi is below that of last season, so the total yields of dry padi for the State may not exceed those of last year.

Agricultural and Padi Stations.

Agricultural Stations.—There is a belief general amongst Chinese vegetable growers that prawn dust and soya bean meal are much more effective as a vegetable fertilizer if soaked in water for a considerable time before application. Preliminary experiments at Ayer Itam Station, Penang, gave just as high a yield from Chinese radish treated with dry prawn dust and bean meal as from plants fertilized with the soaked products. The experiment is being continued.

At Kuala Kangsar Station some 1,000 fruit seedlings were budded and included the budding of a number of durian seedlings with budwood from the famous Datoh Nana tree in Malacca.

At Cheras Station in Selangor a limited number of cuttings of Derris Changi 3 received from the Central Experiment Station, Serdang, were cut in half before being planted. Although most of these cuttings consisted of only three nodes practically all of them formed roots and are growing satisfactorily.

At Tanah Rata Station, Cameron Highlands, the work of providing extra withering accomodation for tea by erecting a second storey to the factory has been completed and the new factory came into operation on December 2nd. The following extraordinarily satisfactory weights of chickens are reported from this Station in this month's report:—

	Batch 1. (age 14 weeks)		Batch 2. (age 11 weeks)		Batch 3. (age 7 weeks)	
	Cockerels	Pullets	Cockerels	Pullets	Cockerels	Pullets
	21	17	24	17	17	36
Mean weight	$4\frac{1}{2}$ lbs.	3 lbs. 1 oz.	2 lbs. 13 ozs.	2 lbs. 10 ozs.	2 lbs. 10 ozs.	1 lb. 5 ozs.

Padi Stations.—Several reports contain reference to the very much better growth and higher tillering exhibited on the plots that received the heavy phosphate manuring last season, as compared with the control plots. This experiment is

being retained this year for determination of residual effect and all plots in the experiment have received three dressings of ammonium sulphate at specified intervals.

An unusually good crop for the Station is being produced at Kuang Station in Selangor this season and *penyakit merah* is hardly noticeable, being in evidence in only very small isolated patches. The cause of this affection, a noticeable symptom of which is a reddening of the leaves, is still undetermined and the fact that it is in evidence in a particular spot in one season, whereas padi growing in the same spot in the succeeding season may show no sign of it, is difficult of explanation. Dr. Wulff, on his recent visit to Malaya, stated that there is a similar phenomenon in the Netherlands Indies, the cause of which has not yet been determined.

DEPARTMENTAL NOTES.

Transfer.

Mr. J. N. Milsum, Senior Agricultural Officer, was transferred from the Central Experiment Station, Serdang, on the 3rd January 1938 to Taiping, where he will officiate as State Agricultural Officer, Perak.

Leave.

Mr. C. W. S. Hartley, Agricultural Officer, has been granted 123 days' leave on full pay with effect from 4th December, 1937, inclusive.

Mr. J. L. Greig, Agriculturist, returned from leave on 30th December, 1937.

Mr. C. H. Burgess, Agricultural Officer, Krian, has been granted 179 days leave from 4th January to 1st July 1938 inclusive. Mr. E. J. H. Berwick, Agriculturist, has assumed duty in the post.

Mr. J. W. Jolly, acting State Agricultural Officer, Perak, proceeded on 232 days leave on the 15th January 1938.

Malayan Agriculture at the Empire Exhibition.

In connexion with the above Exhibition which will be held at Glasgow from May to October 1938, Malayan agriculture will receive the prominence which is due to its importance. A large and very beautiful diorama depicting the interior of a pineapple factory is practically complete. A companion diorama will shew a rubber estate with real rubber trees from which latex flows, and life-size models of labourers engaged in tapping and carrying latex. The pineapple diorama will be supported by the staging of different brands of canned pineapples and by regular cookery demonstrations, while additional rubber exhibits will include a model factory and examples of the more important forms in which rubber is exported.

The Department of Agriculture is engaged in the preparation of exhibits concerning the following crops:—oil palms, coconuts, rice, arecanuts, tapioca, spices, derris and nipah.

Statistical.

MARKET PRICES.

December, 1937.

Major Crops.

Rubber.—With the reduction in quota notified on the 30th November, the market improved in the early part of December, but fell heavily in the second half of the month. Spot loose opened in Singapore at 24$\frac{7}{8}$ cents per lb. and improved to 25$\frac{5}{8}$ cents on the 4th December; it weakened to 24$\frac{1}{2}$ cents on the 13th, and, with minor fluctuations, fell steadily to close at 22$\frac{1}{8}$ cents.

The average price for the month for No. 1. X. Rubber Smoked Sheet was 24.16 cents per lb. as compared with 23.20 cents in November. The London average price was 7.27 pence per lb., and the New York price 14.97 cents gold, as compared with 7.06 pence and 14.43 cents gold in November.

Table I shews prices paid during the month at three centres for small-holders' rubber.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, December, 1937.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.				
	2	9	16	23	8	15	22	29	1	8	15	22	29
Smoked sheet	29.40	30.82	29.00		30.14	29.00	29.00	27.50				28.00	27.50
Unsmoked sheet	27.69	29.00	27.00	27.00					26.40	28 00	27.00	26.30	24.70
Scrap	18.00	18.00											

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 1st, and at Kuala Pilah on the 30th December.

Palm Oil.—The market for palm oil remained steady at a lower level, and kernels shewed a slight improvement. Table II gives the quotations during the month.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
December 3	£ 17. 0. 0	£ 10. 2. 6
„ 10	17. 0. 0	10. 7. 6
„ 17	17. 0. 0	10. 12. 6
„ 24	17. 0. 0	10. 15. 0
„ 31	17. 0. 0	10. 10. 0

Copra.—The Singapore market recovered ground during December but the average prices, sun-dried $4.81, mixed $4.54 per picul, were lower than those of the previous month, $4.85 and $4.60 respectively. The sun-dried grade opened at $4.50 per picul, improved to $5 on the 17th December, but fell to close at $4.75.

Copra cake fell to $1.80 per picul, the average price for the month being $2.15 per picul as compared with $2.40 in November.

Rice.—The average wholesale Singapore prices of rice per picul in November were as follows:—Siam No. 2 (ordinary) $4.12; Rangoon No. 1 $3.92, Saigon No. 1 $3.82, as compared with $4.39, $4 and $3.97 in October and $4.06, $3.47 and $3.72 respectively in November 1936.

The average retail prices in cents per gantang of No. 2 Siam rice in November were:—Singapore 29, Penang 36, Malacca 32, as compared with 31, 35 and 34 respectively in October.

The average declared trade value of imports during November was $4.09 per picul, as compared with $4.09 in October and $4.20 in September.

Padi.—The Government Rice Mills, Perak, continued to pay $2 per picul for padi during December. Retail prices ranged from 7 to 15 cents per gantang.

Pineapples.—There was no further change in the low prices at present ruling: they were (per case): G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and $2.95 respectively.

Prices of fresh fruit per 100 during December were as follows:—Selangor 45 to 50 cents, Singapore 70 cents to $1.20, Johore 1st quality 60 to 80 cents, 2nd quality 40 to 50 cents, 3rd quality 20 to 35 cents.

Beverages.

Tea.—During December eight consignments of Malayan tea were sold on the London market. Two consignments were of upland tea and were sold at 1s. 2d. per lb., while the lowland tea averaged from 1s. 0½d. to 1s. 1¼d. per lb.

Average London prices per lb. during December for consignments of tea from other countries were as follows:—Ceylon 1s. 2.89d., Java 1s. 0.69d., Indian Northern 1s. 1.81d., Indian Southern 1s. 2.15d., Sumatra 11.59d.

The latest Colombo average prices available, quoted from *The Weekly Tea Market Report*, 31st December 1937, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 80 cents, Medium Grown Teas 73 cents, Low Grown Teas 68 cents.

Coffee.—Palembang coffee shewed a slight improvement in December averaging from $10.30 to $10.95 per picul. Sourabaya was slightly lower at $13.10 to $14.10 per picul.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian $14.50 falling to $14; Excelsa $11 falling to $10; Robusta $8 falling to $7.

Spices.

Arecanuts.—The following was the range of Singapore average prices per picul during December:—Splits $5.05 to $8.35; Red Whole $5.35 to $6.40; Sliced $10.25 to $12.65.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $8.36, Medium $7.75, Mixed $7.44.

Pepper.—The market was stagnant during December, and average prices per picul were:—Singapore Black $8.31, Singapore White $13.50, Muntok White $14, as compared with $8.75, $13.75 and $14.25 respectively in November.

Nutmegs.—The price for both 110's and 80's improved to $42 per picul, the average for the month being $41 per picul as against $40 in November.

Mace.—Prices fell in the second half of December and averages per picul for the month were: Siouw $105, Amboina $86.50, as compared with $110 and $88 respectively in November.

Cloves.—Quotations continued nominal at $40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for December at Rs. 0.90—Rs. 1.25 rising to Rs. 1.10—Rs. 1.28.

Miscellaneous.

Derris (Tuba Root).—The market remained dull and prices continued unchanged, roots sold on rotenone content at $26 per picul, and on ether extract at $16 per picul.

Gambier.—Block fell to $8 per picul as compared with an average price of $8.50 in November. No. 1 Cube was quoted throughout at $15.50 as against $15.31 per picul in the previous month.

Tapioca.—Prices were lower in December, and remained unchanged throughout the month at the following levels:—Flake Fair $4.50, Seed Pearl $4.80, Medium Pearl $5.20 per picul, as compared with $4.78, $5.02 and $5.32 in November.

Sago.—Prices were again lower in December. Pearl, Small Fair, averaged $4.11 per picul, and Flour, Sarawak Fair, $2.46 per picul, as compared with $4.89 and $2.89 respectively in November.

Tobacco.—The range of prices per picul for dried leaf was as follows:—1st quality $28 to $50, 2nd quality $17.50 to $44, 3rd quality $8 to $36. Prices for prepared tobacco were as follows:—Kelantan $90 to $100, $70 to $80, $55 to $60; Negri Sembilan $60 to $65, $53 to $58, $45 to $55; Johore (Java tobacco) $40 to $140.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

November, 1937.

Malaya.—Imports of foreign rice during November were 59,300 tons† and exports 17,045 tons, net imports being 42,255 tons as compared with 48,187 tons in 1936. Net imports from January to November totalled 531,703 tons as compared with 488,732 tons in 1936.¶

Of the November imports, 42 per cent. were consigned to Singapore, 22 per cent. to Penang, 7 per cent. to Malacca, 24 per cent. to the Federated Malay States, and 5 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 35,551 (60.0), Burma 20,663 (34.8), French Indo-China 2,360 (4.0), other countries 726 (1.2).

Of the exports during November 72 per cent. were consigned to the Netherlands Indies and 28 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 12,154 (71.3), Burma 3,671 (21.5), French Indo-China 1,118 (6.6), parboiled 60 (0.4), local production 42 (0.2).

India and Burma.—Foreign exports during January to October totalled 657,000 tons, as compared with 1,163,000 tons in 1936, a decrease of 43.5 per cent. Of these exports 3.9 per cent. were to the United Kingdom, 5.8 per cent. to the Continent of Europe, 29.1 per cent. to Ceylon, 21.6 per cent. to the Straits Settlements and the Far East, 39.6 per cent. to other countries. The corresponding 1936 percentages were 3.5, 16.0, 29.3, 21.7 and 29.5.

Siam.—Exports of rice and rice products from Bangkok during September were 80,370 tons, as compared with 153,183 tons in 1936. The cumulative total for the year was 720,402 tons as against 1,232,034 tons in 1936.

The third report of the rice crop of Siam for the season 1937-38, issued by the Department of Agriculture and Fisheries, Bangkok, dated 21st December 1937 gives the cultivated area as 7,736,302 acres. The total damaged area is about 751,759 acres. Approximately 654,285 acres have been harvested, yielding 327,285 tons of padi.

Japan.—The latest information available was published in the October Summary.

French Indo-China.—Entries of padi into Cholon from 1st January to 15th November aggregated 1,315,186 tons as compared with 1,411,407 tons in 1936, a decrease of 6.8 per cent. Exports of rice during the same period totalled 1,387,806 tons as against 1,588,742 tons in 1936, a decrease of 12.6 per cent.

According to the Saigon rice report for November the November exports of rice to Hongkong, 4,791 tons, were far below the normal figure; exports of 16,108 tons to Shanghai were well above the average.

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* Abridged from the Rice Summary for November 1937 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

The Netherlands Indies.—The latest information was published in the October Summary.

Ceylon.—Imports of rice from January to November totalled 480,206 tons as compared with 479,151 tons in 1936, an increase of 0.2 per cent. Of these imports 17.1 per cent. were from British India, 70.2 per cent. from Burma, 0.1 per cent. from the Straits Settlements, and 12.6 per cent. from other countries. The corresponding 1936 percentages were 13.7, 62.5, 0.4 and 23.4.

Europe and America.—Shipments from the East to Europe during the period 1st January to 4th November totalled 1,013,904 tons, a decrease of 7.2 per cent. when compared with the 1936 figure of 1,092,859 tons. Of this year's shipments 41.7 per cent. were from Burma, 52.3 per cent. from Saigon, 4.3 per cent. from Siam, and 1.7 per cent. from Bengal. The 1936 corresponding percentages were 27.1, 63.0, 9.1 and 0.8.

Shipments to the Levant from 1st January to 21st October totalled 15,088 tons as compared with 12,551 tons in 1936, an increase of 20.2 per cent. During the same period, shipments to Cuba, West Indies and America were 213,141 tons as against 224,446 tons, a decrease of 5 per cent.

FERTILIZER PRICES, DECEMBER, 1937.

The following are the prices at the end of December, 1937, of some of the more important fertilizers. All quotations are ex Port Swettenham, F.M.S., or Singapore.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	50.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

MALAYAN AGRICULTURAL EXPORTS, NOVEMBER, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-Nov. 1936	Jan.-Nov. 1937	November, 1936	November, 1937
Arecanuts ...	26,548	24,946	27,005	1,165	2,254
Coconuts fresh † ...	114,314†	107,493†	86,654†	8,724†	7,332†
Coconut oil ...	46,507	43,155	36,104	3,864	3,154
Copra ...	76,681	69,582	65,946	6,838	9,150
Gambier, all kinds ...	2,188	2,012	1,889	253	244
Copra cake § ...	20,438§	18,121§	14,167§	1,248§	1,662§
Palm kernels ...	4,964	4,674	6,817	541	1,399
Palm oil ...	29,296	26,648	39,552	2,874	4,013
Pineapples canned ...	76,403	70,900	75,401	3,097	3,862
Rubber ¶ ...	365,005¶	332,061¶	452,915¶	30,103¶	43,748¶
Sago,—flour ...	6,180	6,586	13,475	347	359
,, —pearl ...	3,319	3,047	3,507	253	388
,, —raw ...	7,484*	6,868*	7,583*	809*	780*
Tapioca,—flake ...	1,535	1,416	1,007	113	83
,, —flour ...	2,418*	1,956*	2,103*	353*	254*
,, —pearl ...	17,797	16,032	15,491	1,330	1,470
Tuba root ...	599	566	549	50	34

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
April ...	1,573.1	1,237.2	308.0	226.0
May ...	1,587.6	1,285.2	257.8	186.4
June ...	1,671.8	1,611.7	288.9	252.5
July ...	2,651.0	1,860.5	411.6	269.6
August ...	3,767.7	1,762.2	616.8	274.0
September ...	3,179.5	1,492.5	621.6	247.1
October ...	3,037.6	1,393.9	569.1	216.1
November ...	2,419.8	1,448.8	455.9	176.7
Total ...	25,430.9	16,282.2	4,572.4	2,569.2
Total January—November, 1936	21,254.5	7,348.5	3,450.9	1,137.8
Total for the year 1936 ...	23,081.2	8,812.3	3,791.0	1,340.7

Stocks on estates at 30th November, 1937 were: palm oil 4,669 tons; palm kernels 443 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH NOVEMBER, 1937.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber not Tapped: Estates which have entirely ceased tapping: Acreage	Percentage of (5) to (2)	Estates which have partly ceased tapping (a): Acreage	Percentage of (7) to (2)	Area of Tappable Rubber never been tapped: Acreage	Percentage of (9) to (2)	Total area not tapped (5) + (7)	Percentage of (11) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
STRAITS SETTLEMENTS :—											
Province Wellesley ...	43,743	28,434	65.0	—	—	15,309	35.0	418	1.0	15,309	35.0
Malacca ...	123,128	85,979	69.8	355	0.3	36,794	29.9	2,373	1.9	37,149	30.2
Penang Island ...	2,592	1,768	68.2	—	—	824	31.8	75	2.9	824	31.8
Singapore Island ...	32,760	21,238	64.8	1,171	3.6	10,351	31.6	125	0.4	11,522	35.2
Total S.S. ...	202,223	137,419	68.0	1,526	0.7	63,278	31.3	2,991	1.5	64,804	32.0
FEDERATED MALAY STATES :—											
Perak ...	290,735	221,438	76.2	1,210	0.4	68,087	23.4	6,585	2.3	69,297	23.8
Selangor ...	331,617	260,374	78.5	1,148	0.4	70,095	21.1	7,356	2.2	71,243	21.5
Negri Sembilan ...	258,341	191,418	74.1	1,775	0.7	65,148	25.2	8,173	3.2	66,923	25.9
Pahang ...	85,019	64,778	76.2	3,777	4.4	16,464	19.4	9,139	10.7	20,241	23.8
Total F.M.S. ...	965,712	738,008	76.4	7,910	0.8	219,794	22.8	31,253	3.2	227,704	23.6
UNFEDERATED MALAY STATES :—											
Johore ...	473,948	361,923	76.4	3,118	0.6	108,907	23.0	33,142	7.0	112,025	23.6
Kedah ...	177,543	135,804	76.5	2,854	1.6	38,885	21.9	5,331	3.0	41,739	23.5
Kelantan ...	28,326	22,712	80.2	273	1.0	5,341	18.8	3,266	11.5	5,614	19.8
Trengganu (b) ...	4,817	3,172	65.9	—	—	1,645	34.1	100	2.1	1,645	34.1
Perlis ...	1,330	689	51.8	—	—	641	48.2	107	8.0	641	48.2
Brunei ...	5,569	3,774	67.8	1,125	20.2	670	12.0	754	13.5	1,795	32.2
Total U.M.S. ...	691,533	528,074	76.4	7,370	1.0	156,089	22.6	42,700	6.2	163,459	23.6
Total Malaya ...	1,859,468	1,403,501	75.5	16,806	0.9	439,161	23.6	76,944	4.1	455,967	24.5

Notes :—(a) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(b) Registered companies only.

MALAYAN RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF NOVEMBER, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Dealers	Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Jan. to Nov. 1937	Production by Estates of less than 100 acres estimated 2: during the month	Jan. to Nov. 1937	Imports during the month: Foreign	From Malay States & Labuan	Imports Jan. to Nov. 1937: Foreign	From Malay States & Labuan	Exports including re-exports during the month: Foreign	Local	Jan to Nov. 1937: Foreign	Local	Stocks at end of month: Ports	Dealers	Estates of 100 acres and over	Consumption 3: during the month	Jan. to Nov. 1937
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	8,908	14,823	14,452	150,562	7,921	82,145	Nil	Nil	Nil	Nil	16,224	5,012	167,098	58,833	...	9,879	14,976	13	171
Johore ...	...	2,594	5,077	6,404	65,096	4,189	45,633	Nil	69	Nil	2,378	3,862	6,567	37,988	74,081	...	2,673	5,231	...	...
Kedah ...	...	611	3,696	3,800	37,097	1,202	13,998	Nil	Nil	Nil	Nil	2,308	2,597	23,488	27,121	...	516	3,888	...	...
Perlis ...	...	17	16	19	169	27	272	Nil	Nil	Nil	Nil	Nil	48	Nil	432	...	16	15	...	...
Kelantan ...	...	592	345	377	4,094	834	8,889	Nil	Nil	Nil	Nil	308	947	3,516	9,058	...	561	332	...	...
Trengganu ...	...	55	50	347	3,302	174	1,652	Nil	Nil	Nil	Nil	Nil	521	Nil	4,954	...	55	50	...	...
Brunei ...	...	23	59	68	681	95	932	...	...	...	...	...	144	...	1,558	...	31	70	...	...
Total Malay States	...	12,800	24,066	25,467	261,001	14,442	153,521	Nil	69	Nil	2,378	22,702	15,836	232,090	176,037	...	13,731	24,562	13	171
S. SETTLEMENTS :—																				
Malacca ...	...	2,307	1,292	1,560	15,695	927	8,589	Nil		Nil		3,322		34,463		...	2,171	1,272	...	...
Province Wellesley	...	2,306	839	594	6,108	321	3,145	Nil		Nil		9,250		93,664		...	2,976	828	...	...
Penang ...	2,096	5,880	23	25	219	141	*1,336	2,661	17,250	31,911	173,072		Nil		Nil	1,868	5,137	23	...	...
Singapore ...	5,735	28,254	235	210	2,060	36	*1,032	9,646		166,969		22,576		264,630		5,791	26,007	244	33	355
Labuan ...	...	32	Nil	Nil	Nil	25	209	89		617		Nil		Nil		...	47	Nil	...	...
Total Straits Settlements ...	7,831	38,779	2,389	2,389	24,082	1,450	14,311	12,396	17,250	199,497	173,072	35,148	Nil	392,757	Nil	7,659	36,338	2,367	33	356
Total Malaya ...	7,831	51,579	26,455	27,856	285,083	15,892	167,832	12,396	17,319	190,497	175,450	57,850	15,836	624,847	176,037	7,659	50,069	26,929	46	526

* Figures amended.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	8,780	25,398	4,902	4,885	2,171	173
WET RUBBER	1,099	609	235	340	502	343
TOTAL ...	9,879	26,007	5,137	5,225	2,673	516

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan to Nov 1937
29	30	31
Singapore ...	38,461	420,393
Penang ...	14,639	143,539
Port Swettenham.	4,431	58,372
Malacca ...	319	2,543
MALAYA ...	57,850	624,847

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Nov 1937
32	33	34
Malay States ...	38,494	405,638
Straits Settlements	3,733	37,935
MALAYA ...	42,227	443 573

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 23rd December, 1937

METEOROLOGICAL SUMMARY, MALAYA, NOVEMBER, 1937.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.2	72.5	80.9	93	70	85	74	83.7	84.6	11.75	298.5	2.11	25	21	4	6		148.05	4.93	41
Bukit Jeram, Selangor ...	88.0	72.6	80.3	91	70	85	74	84.1	86.1	5.94	150.9	2.83	21	11			1	196.50	6.55	55
Sitiawan, Perak ...	87.8	74.0	80.9	92	72	84	76	83.9	84.4	15.34	389.6	3.01	23	21	3	3		179.55	5.99	50
Temerloh, Pahang ...	88.8	72.8	80.8	92	71	82	74	85.6	86.3	8.18	207.8	1.42	21	20	2	1		168.65	5.62	47
Kuala Lipis, Pahang ...	88.5	71.9	80.2	91	70	80	74	84.2	85.0	13.80	350.5	2.58	24	21	1	15		154.75	5.16	43
Kuala Pahang, Pahang ...	85.6	73.9	79.7	89	72	80	76	84.1	86.0	14.01	355.9	6.80	19	15				209.00	6.97	58
Kallang Aerodrome, S'pore ...	85.8	74.9	80.3	89	72	81	77	82.3	83.7	9.00	228.6	2.00	17	14	9			157.75	5.26	43
Bayan Lepas Aerodrome Penang ...	86.3	74.3	80.3	90	73	82	76	84.1	84.4	13.57	344.7	3.96	26	19	6			188.00	6.27	53
Bukit China, Malacca ...	85.2	73.4	79.3	88	71	82	75	82.7	84.1	9.28	235.7	2.18	23	20	3		2	187.80	6.26	52
Kluang, Johore ...	87.9	71.4	79.7	91	69	83	73	81.9	82.6	8.92	226.6	2.52	26	20	5	13		155.00	5.17	43
Bukit Lalang, Mersing, Johore	85.4	72.0	78.7	89	70	79	74	81.8	81.9	10.34	262.6	2.17	21	15	1	1		195.70	6.52	54
Alor Star, Kedah ...	87.9	73.6	80.7	91	71	83	75	84.3	85.5	12.12	307.9	4.31	21	19	2	4		185.95	6.20	52
Kota Bahru, Kelantan ...	85.9	73.4	79.7	90	71	78	75	83.5	84.7	11.81	300.0	4.02	19	18		1		175.40	5.85	49
Kuala Trengganu, Trengganu	85.1	73.1	79.1	88	71	76	75	82.6	84.3	7.46	189.5	2.94	16	12	2			193.15	6.44	54
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	72.7	62.3	67.5	76	59	64	64	71.7	72.3	16.38	416.1	1.76	28	27	4	20		115.50	3.85	32
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.8	57.7	64.7	75	54	67	62	70.5	70.4	12.23	310.7	1.60	27	25		1		101.60	3.39	28
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.9	59.3	65.6	76	55	68	61			12.12	307.9	1.55	27	24		1		104.55	3.49	29

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

FEBRUARY, 1938.

EDITORIAL.

Small-Scale Palm Oil Production.

In a recent number of this Journal* we discussed the advance which has been made during the past few years in the sphere of engineering in connexion with palm oil production. We stated that the early view was that the economic unit to plant was a very considerable area because the machinery for extracting the oil was large and expensive, but that machinery is now available to suit the requirements of almost any area above 200 acres.

In the present number of this Journal we publish a discussion on the possibility of producing palm oil on small holdings of about 20 acres. Messrs. Milsum and Georgi, who were responsible for this investigation, discuss the subject from the point of view of production of oil. They employed a type of hand-press which has been evolved for use in Nigeria and produce data concerning the efficiency of this press under local conditions. The authors conclude that the small hand-press, with careful working, is capable of producing an oil equal in quality to the oil at present obtained on Malayan plantations. Although a high-quality oil can be assured, producers cannot expect an oil recovery of more than 70 per cent. as compared with 90 per cent. on estates.

We consider the assurance that high-quality oil can be produced under small-holding conditions as of paramount importance, for had it been otherwise, the production of palm oil under these conditions would have presented grave difficulties in marketing, particularly in the early stages of development as a small-scale industry. Furthermore, it is desirable to maintain Malaya's reputation for a high-quality palm oil suitable for edible and other special purposes.

The fact that small-scale production results in the recovery of only 70 per cent. of the oil content is unlikely seriously to discourage planting on small holdings as the economics of production on small holdings are not viewed in the same light as by owners of large estates. It is always possible, too, that further improvements may be made either in the perfecting of machinery or in the process of extraction, which will result in a greater oil recovery.

While, therefore, we are satisfied that the production of palm oil of good quality is possible on small holdings, the disposal of the crop presents difficulties, especially in the initial stages of a small-holding industry. One or two planters of

* *Malayan Agricultural Journal*, Vol. XXV. No. 11, November, 1937.

a few acres of oil palms have recently asked the advice of the Department of Agriculture regarding the sale of their produce. In each case we have advised our enquirers to seek an arrangement for sale to near-by large estates, but we are at present unaware whether estates are prepared to consider any great development of this system. Shipments are rarely effected for a smaller quantity than 5 ton lots, a quantity which would normally be beyond the scope of the small-holder.

The establishment of palm oil production on small holdings will be rendered easy if a number of such holdings are developed in the same district. These areas need not be contiguous, but sufficiently near to render possible concerted action for the sale of oil and kernels. Oil bulked from such producers could be sold through the present channels without difficulty.

The successful development of a combine of owners of small areas in one district would doubtless lead to similar developments in other areas and might therefore result ultimately in a valuable addition to the crops considered suitable for cultivation on small areas in Malaya.

Yield of Arecanuts.

The arecanut industry in Malaya is of considerable importance, as can be proved by the official figures of net exports. In 1936, for instance, the net exports exceeded 26,500 tons, valued at over 3½ million dollars. The total area under the crop is 50,000 acres, of which 35,000 acres are situated in Johore and about 6,000 acres in Kelantan. The industry is therefore of particular importance in these two States, but it is also considered a welcome money-producing crop to Asiatic small-holders throughout the country.

We have always considered that arecanuts warranted serious consideration as a crop for large-scale cultivation, but data concerning varieties, their behaviour under varying soil and other conditions, the economic life of the plantation, and the yields that might be expected have been so meagre and unreliable that it has been impossible to advance a case in favour of such development of the industry.

While personal observation may assist a determination of the approximate conditions under which the palm should be cultivated, and its economic life, the present conditions under which it is grown and harvested preclude anything but an estimate of yield, and such estimates as have been determined by various observers have varied so widely that it has been impossible to use the figures as a basis for making estimates of probable production costs.

Mr. J. N. Milsum publishes the first reliable data we have seen on yields in Malaya. Admittedly, the conditions under which the palms were grown were not those met with on a plantation, but the author compares the yields of varieties grown under similar conditions. The investigation is particularly useful for this examination of varieties, but we desire to emphasise that his suggested yield under plantation conditions of from 10 to 15 piculs (1,300 to 2,000 lbs.) per acre is merely an estimate and is therefore offered with reservations.

Original Articles.

SMALL SCALE EXTRACTION OF PALM OIL

BY

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and
C. D. V. GEORGI,
Senior Chemist.

Introductory.

The oil palm, which is an introduction to Malaya, has generally been regarded as a crop more suited to estate cultivation than to the small-holder.

This is partly due to the fact that as a result of stressing the importance of quality of product, particularly the oil, a well-equipped factory has rather come to be regarded as an essential for the extraction of palm oil and palm kernels. The outlay necessary for such a factory is far beyond the reach of the small-holder.

Another and possibly a more cogent reason is to be found in the absence of any enthusiasm on the part of the native population to adopt palm oil in preference to coconut oil for household purposes.

Since external markets had therefore to be sought for both products it has always been felt that a small-holder would have considerable difficulty in disposing of his produce in the absence of any central organization prepared to purchase small quantities of oil or kernels. Further, until the introduction of the steel drum a few years ago as the general method of packing for small quantities of oil, the assembling and the use of the light wooden barrel, which required careful handling to avoid leakage, would have been an added disadvantage from the point of view of the small-holder.

As regards quality of products, the small-holder can extract both palm oil and palm kernels of a quality equal to those produced on estates, provided the principles underlying the preparation of high-quality products are followed. This was clearly shown in the early days of the industry when estates with improvised hand-operated plant easily maintained a quality of oil equal to the present estate standard.

From the point of view of the estate, the disadvantage of this system was the amount of labour required; in the case of the small-holder this would not apply, seeing that he works for himself and has no overhead charges to meet.

In Nigeria, where the production of palm oil is a native industry, several years of continuous study by the Department of Agriculture of that country of many types of press and of extraction processes resulted in the evolution of the press and the process described below. This press-process is now being widely adopted in Nigeria in place of the old native methods.

The presses, which are manufactured by Duchscher & Co., Wecker, Luxemburg, are available in various sizes, the most popular being known as N.G. No. 1 type, holding about 150 lbs. of fruit. One of these presses was imported from England last year and installed at the Central Experiment Station, Serdang, for trial with local fruit.

Description of Press.

The press consists of a cage composed of strips of seasoned oak, arranged longitudinally and hooped with two iron bands. The cage, which is 20 inches in diameter and 20 inches high, is made in two halves, which are bolted together. This arrangement ensures rapid emptying of the cage on completion of a pressing.

Pressure is applied by means of a ram working on a screw. The upper part of the ram terminates in a crosshead into which two levers are fixed to actuate the ram.

The press rests on a solid iron base, which can be bolted down.

A wooden false bottom is provided for the cage, also covering beams for inserting above the charge of fruit. The beams tend to ensure an even distribution of pressure on the mass while being pressed. Both the false bottom and the covering beams are made of seasoned oak.

The general arrangement of the press is shown in the accompanying photograph.

Method of Working.

The following is a description of the extraction process which, apart from one or two slight modifications, follows standard Nigerian practice.

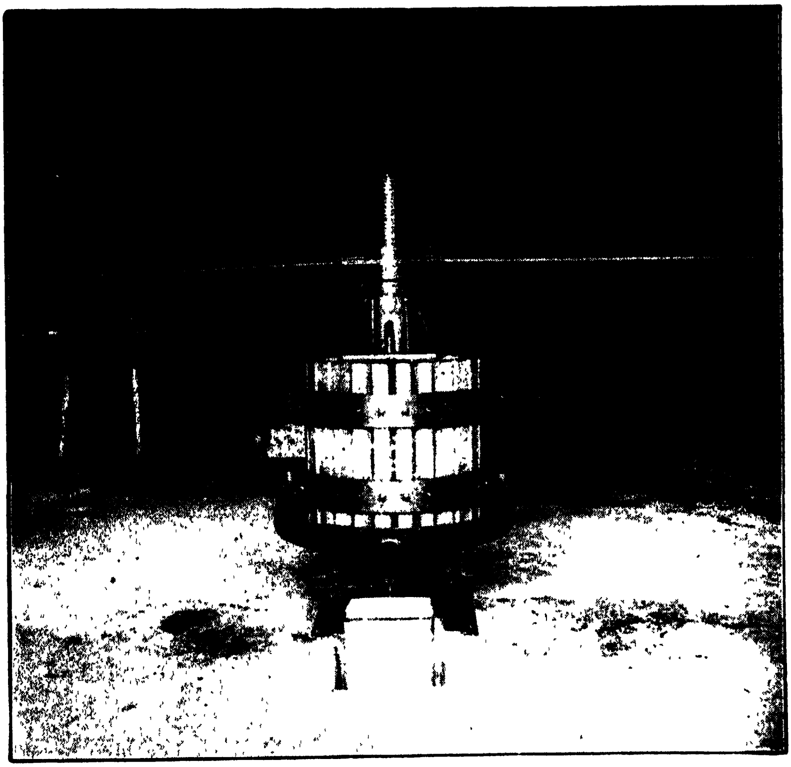
1. *Sterilization of Fruit.*—Loose fruit, 150 lbs. in weight, is placed in a wire cage fitting into a 40 gallon oil drum, half filled with hot water. The cage can be raised or lowered by means of a block and tackle. The fruit is allowed to simmer for between 5 and 6 hours, after which time the pericarp is sufficiently soft to be detached from the nuts on pounding.

Three of these oil drums are set in a row over a roughly constructed fire-place to ensure a plentiful supply of fruit for pressing.

2. *Mashing of Fruit.*—The charge of fruit is withdrawn and divided equally between two small oil drums. The fruit is then pounded with a wooden pestle. The latter must be provided with a large head to ensure satisfactory pounding.

Experience shows that mashing of the fruit is the most important part of the whole process. The large proportion of pericarp in the Deli type of fruit necessitates pounding for between 10 and 15 minutes before the fruit is completely disintegrated.

With mixed fruit, it is noticed that a proportion of the small individual fruits escapes pounding; they appear to remain in suspension in the mash. For this reason it is recommended to screen the loose fruit before treatment to exclude any obviously undeveloped fruits.



HAND PRESS FOR PALM OIL EXTRACTION.

3. *First Pressing.*—The cage is charged with the hot mash and the pressure applied slowly to prevent an excess of mucilaginous matter or sludge exuding with the oil. Two men are sufficient to work the press, gradually applying as much pressure as the machine can exert. There is no danger of cracking the nuts owing to the high proportion of pericarp in the fruit. The crude oil is collected in a 4 gallon kerosene tin placed below the outlet from the press.

A slow application of pressure is an essential for this stage of process. If more than two men are set to work the press the oil will be found to contain a much greater proportion of sludge, while in addition the crosshead levers may be bent.

4. *Separation of Nuts and Pericarp Residue.*—The pressure is released, the cage opened and the cake of nuts and pericarp residue removed. The latter must be separated by hand picking. The time required for this operation can be reduced by arranging a sloping surface of boards at an angle of about 30°. Small quantities of the material are placed at the top of the slope and agitated by means of a short length of board. Provided the sterilized fruit has been pounded satisfactorily, a fair proportion of nuts, to which practically no pericarp residue remains attached, will roll to the bottom of the slope, leaving much of the pericarp residue at the top held against the short length of board. Final hand-picking of the residue is, however, necessary.

The surface of the nuts was found to be still markedly oily. Quite an appreciable amount of oily cellular matter could be recovered by agitating the nuts on a wire screen. As the nuts rub against each other the oily residue falls away and passes between the meshes of the screen.

The nuts are removed for drying and cracking. These processes will not be referred to in the present paper.

The pericarp residue is set aside for second pressing.

Separation of the press residue is facilitated if the material before being treated as described can be warmed slightly. Heating can be carried out on iron sheets similar to those used in heating the pericarp residue for the second pressing as described in the next section.

5. *Second Pressing.*—Two sheets of corrugated iron are supported by means of bricks about 18 inches from the ground and a small fire lighted below the sheets. The pericarp residue is placed on the corrugated iron and moved continuously by means of a rake to warm the material and to drive off a large proportion of the moisture. Heating is continued until the material feels only slightly moist.

As soon as sufficient material is available to fill the cage, the second pressing is carried out. Experiments showed that three first pressings (450 lbs. of fruit) must be made before there was sufficient pericarp residue to fill the cage.

A similar procedure to that adopted for the first pressing is followed. As much pressure as the machine can exert is applied, appreciable pauses being made between each application to ensure an even distribution of pressure throughout the mass and consequently an even flow of oil.

The oil from the second pressing contains a much larger proportion of mucilaginous matter or sludge than that from the first pressing.

6. *Treatment of Crude Oil.*—The expressed oil, which contains both water and mucilaginous matter, is heated in a circular iron pan to evaporate the water and to coagulate the mucilage. Some of the mucilage floats to the surface and can be skimmed off by means of a ladle.

The period of heating is determined by the appearance of the oil, which gradually becomes clear as the water evaporates, and the remainder of the mucilaginous matter settles to the bottom of the pan as a sludge.

The contents of the pan are allowed to cool somewhat, skimmed again to remove the last traces of mucilage from the oil, which is filtered through fine cloth into a drum or tins.

The moisture content of the oil should not exceed 0.3 to 0.4 per cent., the dirt content 0.02 per cent. or less.

When ladling the oil care must be taken not to include any sludge, as its presence in the oil will result in a marked increase in acidity on storage.

To avoid loss of oil it is suggested that the top few inches of sludge, which contain the greater part of the oil entrained therein, should be set aside for mixing with the next batch of crude oil.

Results of Tests.

The results of efficiency tests show that with double pressing between 70 and 75 per cent. of the oil present in the fruit can be recovered.

The details of one test were as follows:—

	lbs.
Weight of fruit	450
	per cent.
Oil recovered	72.0
LOSSES OF OIL:	
Pericarp residue	11.5
Surface of nuts	6.0
Sludge in oil recovery	10.5
	100.0
Calculated oil content of fruit	30.8
Acidity of oil (calculated as palmitic acid)	2.7

As far as could be judged the proportions of oil recovered in the first and second pressings were about 67 and 5 per cent. respectively.

Discussion.

The results show that using only improvised plant, apart from the press, the small-holder can attain with double pressing as described an efficiency of about 72

per cent. This figure corresponds to a recovery of about 23 per cent. on the weight of ripe fruit treated, compared with a total oil content of about 31 per cent.

The wire-cage, complete with block and tackle, was used only for the purpose of convenience. These could be dispensed with without any appreciable reduction in speed of working, the loose fruit being tipped into the hot water and the sterilized fruit baled out with perforated dippers to which long wooden handles are attached.

The cost of the press landed in this country is about $170 (Straits currency). As far as the small-holder is concerned two questions arise: (*a*) the maximum acreage which a press of this type will serve, and (*b*) the minimum acreage on which a small-holder would feel inclined to spend the above sum for a press.

With regard to the maximum acreage the figure would appear to be about 40 acres, the details of the calculation being shown below.

It should be explained that in framing this calculation the following data have been assumed: (*a*) the oil palms are mature and the yield of oil using factory methods amounts to 15 cwts. of palm oil per acre per annum, (*b*) the small-holder with an assistant supervises the factory process, and (*c*) additional labour is available in the field to cut the bunches and deliver the clean fruit to the factory.

Taking conventional figures of 90 per cent. oil recovery on weight of fruit treated and 30 per cent. by weight of oil in the fruit, an output of 15 cwts. of palm oil per acre per annum is equivalent to approximately 6,200 lbs. of fruit per acre per annum.

Records collected from estates in Malaya show that during the peak month as much as 13 per cent. of the annual output of oil may be produced.(1) This is equivalent to about 800 lbs. of fruit per acre.

Working ten hours per day in the factory the two men should be able, with the incidental work involved in the refining of the crude oil, to treat by single pressing say seven charges per day, that is 1,050 lbs. of fruit.

If they are willing to work 30 days per month, during the peak month 30 x 1,050 lbs. of fruit can be treated.

Assuming that the yield of fruit in the peak month is 800 lbs. per acre, the maximum acreage which the press can serve is $\frac{30 \times 1050}{800} = 39.5$ acres.

It is realized that this estimate is conservative; it is based on the maximum output of fruit which two men can treat in an average working day, but the figure does not represent the capacity of the press.

Pressing is not the limiting factor; boiling of the fruit, pounding and separation of pericarp residue and nuts are far more important in that connexion. If more labour were available in the factory it is considered that one press of this type might serve double the area, say 70 to 80 acres.

The minimum acreage on which a small-holder would be willing to instal a press of this type is difficult to foretell. An acreage of 10 acres is suggested, but in any case the figure can only be a guess.

The estimated annual yield of oil from 40 acres, based on the above data and the results of the efficiency tests carried out, would amount to about 23 tons. This amount of oil is equivalent to about 11.5 cwts. per acre per annum, compared with the 15 cwts. per acre per annum that would be obtained if the fruit were treated in an estate factory.

Acknowledgment.

The authors wish to acknowledge the assistance received in the preparation of this paper from Mr. O. T. Faulkner, C.M.G., Adviser on Agriculture, Malay States, and officers of the Department of Agriculture, Nigeria, in supplying details of the press-process used in that country.

Reference.

(1) Bunting B., Georgi C. D. V., and Milsum J. N. The Oil Palm in Malaya. Malayan Planting Manual No. 1, 1935, p. 93.

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LOCAL ARECANUTS

BY

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Introductory.

The arecanut palm (*Areca catechu,* L.) is commonly found growing in Malay holdings throughout the country. It is not indigenous to Malaya and there is no exact knowledge where its original home was. There is evidence, however, that it has been cultivated in Malaya for many centuries, and in parts of Johore it is grown as a plantation crop. There are many races of the palm, but owing to cross-pollination and the difficulty experienced by the Asiatic cultivator in perpetuating desirable forms, these races are ill-defined.

During 1926 a collection of local arecanut varieties was made by the Botanical Division of the Department of Agriculture. The majority of the fruits were obtained from plantations at Batu Pahat, Johore, and the remainder from Selangor. Two varieties were selected from a mixed population of palms growing at the Central Experiment Station, Serdang.

The fruits were germinated at the Coconut Experiment Station, Port Swettenham, and planted out in 1927 and early 1928. The young palms were planted in line surrounding a rectangular block of coconuts, being spaced 10 feet apart in single rows. This planting arrangement does not allow of satisfactory comparison of crop production between varieties being made, since there is a complete lack of randomization. Further, since the palms are planted in line, yields are not comparable with palms established in a block of land. However, the spacing for all varieties and their treatment is the same, and soil conditions are fairly uniform, and in so far as methods of statistical analysis can be applied to the data under these conditions, the figures indicate that real varietal differences in yield exist.

Six years from planting, the palms produced a fair amount of fruit, and crop records from individual palms were taken in May, 1934, and have been recorded monthly since that date. Weights of fresh fruit from the thirteen varieties totalling 440 palms, are available for a period of three years, *i.e.* from May 1934 until April 1937, and these are summarized in this paper. In addition, analyses of fruit and nuts of average samples of all varieties have been undertaken by the Chemical Division and the writer is indebted to the Senior Chemist, S.S. and F.M.S. for this data.

Varieties Established.

It should be noted that the Malay nomenclature of arecanut varieties in unreliable. They are mostly named according to the size and shape of their fruits and kernels, the amount of endosperm and their taste. A more detailed study

of the subject is necessary before it is possible to state whether the names now employed are in general use or merely used in the district where the fruit was collected. Further, since the arecanut palm is normally cross-pollinated, owing to the sequence of male and female phases on the spadix, there is uncertainty as to what extent they may breed true to type.

Many of the palms growing at Port Swettenham have retained the distinguishing varietal characters of fruit and nut of the mother palms. Examination of fruits from all palms is necessary to obtain more exact information on this point.

The following list shows the varieties established, together with their origin and date of planting:—

Variety.	Origin.	Date planted.
Kuning	Batu Pahat, Johore.	September 1927
Jambu	- do -	- do -
Malan	- do -	- do -
Buntut Tabuan	- do -	- do -
Betul	- do -	- do -
Rambai	- do -	- do -
Telor	Kuala Lumpur and Kampong Kuantan, Selangor.	- do -
Kechil	Kuala Lumpur, Selangor.	- do -
Wangi	Asam Jawa, Selangor.	- do -
Kerdu	Kampong Asahan, Selangor.	- do -
Ranggong	Jeram, Selangor.	- do -
Seluang	Central Experiment Station, Serdang, (Block 8, row 61, palm 12).	April, 1928.
Gasing	Central Experiment Station, Serdang, (Block 8, row 62, palm 14).	- do -

Brief descriptions of the above varieties, together with illustrations of the fruits and nut, have already been published in this journal (1). In the article under reference, the races were classified according to the shape of the nuts, *i.e.* whether round or elongated.

In the following table, the actual yields of fresh fruit harvested from all varieties over the three year period are shown, together with the calculated amount of air-dry nut (10 per cent. moisture) per palm per annum.

Table I.

Total Yields of Fruit and Nut Per Palm.

Variety.	No. of Palms.	Weight of Fresh Fruit in lbs.				Air-dry Nut to Fresh Fruit.	Calculated Air-dry Nut per Palm per annum.
		May 1934 -Apr.1935	May 1935 -Apr. 1936	May 1936 -Apr. 1937	Mean per Palm per annum		
						per cent.	lbs.
Betul ...	21	757	806	702	36	24.1	8.7
Wangi ...	51	2,188	2,964	2,307	49	17.6	8.6
Ranggong ...	43	1,438	1,839	1,767	40	18.0	7.2
Seluang ...	41	1,652	1,459	1,632	38	18.7	7.1
Jambu ...	29	860	654	928	28	21.2	5.9
Telor ...	30	664	869	1,186	30	18.3	5.5
Buntut Tabuan ...	33	1,236	1,118	852	32	16.7	5.3
Kechil ...	20	375	314	841	25	19.2	4.8
Rambai ...	26	730	983	728	31	13.5	4.2
Kerdu ...	60	1,358	1,440	1,853	36	13.7	3.6
Kuning ...	35	853	879	1,111	27	12.7	3.4
Malan ...	18	332	494	419	23	14.5	3.3
Gasing ...	33	802	622	509	19	13.0	2.5
TOTALS ...	440	13,245	14,441	14,835			
AVERAGES ...					32	17.0	5.4

The varieties are arranged in order of their ultimate yield of calculated air-dry nut per palm per annum. All are suitable for the local market. The commonest and most popular varieties are ***Pinang betul, jambu, kuning, telor, ranggong, seluang,*** and ***kerdu.***

The mean yield of air-dry nut is 5.4 lbs. per palm for all varieties, over a period when the palms were seven to ten years old. It is unusual to meet with palms as a pure stand and, therefore, difficulty has been experienced in obtaining actual yields per acre from this crop. It is estimated, however, that on alluvial soil with close planting, *i.e.* 400 to 480 per acre, young palms yield between 10 and 15 piculs (1 picul = 133 lbs.) dry nut per annum per acre.

Soil Conditions.

The arecanut palm is considered to require a rich alluvial soil with plenty of moisture. A comparison between yields at the Coconut Experiment Station, Port Swettenham, situated on a heavy alluvial clay, and the Central Experiment Station, Serdang, where the arecanuts are growing on hill quartzite soil, shows considerably higher yields at the former Station, where the yield of air-dry nut per palm is 5.4 lbs., while on hill quartzite soil at Serdang, a yield of 1.5 lb. is the maximum so far obtained. These yields are not strictly comparable since the palms at Port Swettenham are planted in line, while those at Serdang are in a compact block, spaced 8 feet apart.

Growth of Palms.

The height of palms of all varieties was measured in August, 1937, *i.e.* ten years from planting, and little or no appreciable difference was found between varieties. Average height of palms is 30 feet from ground level to base of the petioles and a further 10 feet to the apex of young leaves. Thus the average growth increase of these palms has been so far 4 feet per annum.

Table II.

Analyses of Fruit and Nut.

Variety.	Palm No.	Average Weight of Fruit.	Proportion of Pericarp.	Proportion of Nut.	Average Weight of Air dry Nut.
		gms.	per cent.	per cent.	gms.
Betul* ...	20	60.4	65.5	34.5	14.6
Wangi* ...	5	67.5	70.0	30.0	11.9
Ranggong ...	7	57.4	67.0	33.0	10.6
Seluang ...	16	45.4	70.1	29.9	8.5
Jambu ...	5	58.2	62.8	37.2	12.4
Telor* ...	7	46.8	67.6	32.4	6.8
Buntut Tabuan ...	2	43.0	72.1	27.9	7.2
Kechil* ...	9	44.8	68.0	32.0	8.6
Rambai* ...	9	30.0	77.1	22.9	4.0
Kerdu* ...	5	51.0	76.0	24.0	7.0
Kuning* ...	20	63.8	79.5	20.5	8.1
Malan* ...	12	78.5	74.8	25.2	11.6
Gasing ...	14	39.2	77.6	22.4	5.1
AVERAGES ...		52.7	71.4	28.6	8.9

Analyses of Fruit and Nut.

In Table II the results of analysis of fruit and nut are shown together with the palm number from which the sample of fruit was obtained.

The moisture content of pericarp and nut was determined for the eight varieties marked with an asterisk and averaged 80.6 and 43.2 per cent. respectively.

Reference.

(1) Sands, W. N. Observations on the Betel-Nut Palm and Betel-Nuts. *Malayan Agricultural Journal*, Vol. XIV, No. 7, July 1926, p. 202.

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RICE IN MALAYA IN 1937

BY

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The average wholesale price of rice in 1937 was \$4.02 per picul, as compared with \$3.63 per picul in 1936. While Rangoon and Saigon rice prices advanced by averages of 31 and 33 cents per picul only, Siam rice (No. 2) rose by an average of 53 cents per picul. Considering that 50.5 per cent. of net imports were from Siam, (as compared with 63.2 per cent. in 1936) it follows that the Malayan consumer paid a good deal more for his rice in 1937 than he did in 1936. Burma rice comprised 43.8 per cent. of net imports (32 per cent. in 1936) and French Indo-China 4.1 per cent. (4 per cent. in 1936).

The retail price of rice advanced to a greater extent than the wholesale price; this remark applies in particular to Penang and Malacca, where the average price per gantang rose by 7 and 6 cents respectively — an increase of about 24 per cent.

No widespread abnormal conditions were reported from the chief rice-producing countries of the world, and there is no reason to suppose therefore that any drastic price movements are likely to be caused by shortage of supplies in 1938.

There was no change in the freight charges to Malaya and no major changes in local railway rates for transport of rice.

The details of wholesale and retail prices are given in Table I.

Table I.

Average Prices of Rice and Padi in Malaya in 1937.

Month	Wholesale Prices of Rice Dollars per Picul (133 lbs.)			Retail Prices of Rice Cents per Gantang (Gallon)			Price of Padi per Picul at Government Rice Mills Perak
	Siam No. 2 (ordinary)	Rangoon No. 1	Saigon No. 1 (Long Grain)	Singapore	Penang	Malacca	
January ...	4.95	3.67	4.50	32	37	35	1.90
February ...	4.66	3.67	4.02	32	36	33	2.00
March ...	4.44	3.60	3.82	29	36	30	2.00
April ...	4.40	3.57	3.70	29	37	33	2.00
May ...	4.21	3.62	3.60	28	36	32	2.00
June ...	3.91	3.57	3.65	28	35	30	2.00
July ...	4.08	3.55	3.72	28	36	32	2.00
August ...	4.79	3.92	4.12	29	40	34	2.00
September ...	4.57	3.92	4.12	34	37	34	2.00
October ...	4.39	4.00	3.97	31	35	34	2.00
November ...	4.12	3.92	3.82	29	36	32	2.00
December ...	4.14	3.95	3.97	28	36	29	2.00
Average for 1937 ...	4.39	3.75	3.92	30	36	32	1.99
Average for 1936 ...	3.86	3.44	3.59	28	29	26	1.91

Imports and Exports.

A statement of the annual imports and exports of rice with values for the past nine years, is given in Table II, from which it will be seen that consumption of imported rice in 1937 increased by 7.3 per cent. to the highest total reached since 1930. The gross imports declined slightly, while exports decreased by 24 per cent. This decrease in entrepot trade is mainly accounted for by the Netherlands Indies, shipments to which were 91,997 tons in 1937 as compared with 130,503 tons in 1936.

Table II.

Rice: Malayan Imports and Exports.

Year	Imports		Exports		Net Imports	
	Tons	Value $	Tons	Value $	Tons	Value $
1929 ...	785,558	95,461,036	233,897	28,031,407	551,661	67,429,629
1930 ...	800,443	87,666,723	208,688	23,361,561	591,755	64,305,162
1931 ...	691,112	48,458,102	175,385	13,453,189	515,727	35,004,913
1932 ...	592,209	39,632,925	183,209	12,660,493	409,000	26,972,432
1933 ...	592,912	33,846,158	159,746	9,493,291	433,166	24,352,867
1934 ...	619,199	32,813,558	165,968	8,609,566	453,231	24,203,992
1935 ...	655,845	40,114,794	184,463	11,060,993	471,382	29,053,801
1936 ...	715,632	43,053,805	181,837	10,846,378	533,795	32,207,427
1937 ...	711,581	47,800,364	138,518	9,589,376	573,063	38,210,988

The net imports of rice in 1937 were 573,063 tons as compared with 533,795 tons in 1936. Of 1937 net imports, 289,283 tons were from Siam, 250,792 tons from Burma, 23,623 tons were from French Indo-China and 9,365 tons from other countries.

The different grades of rice products imported during 1936 were as follows (net imports only are given):—cargo rice 26,328 tons, parboiled 62,738 tons, white rice 424,870 tons, broken rice 59,127 tons as compared with 23,526, 50,267, 374,890

and 85,112 tons respectively in 1936. Thus, while broken rice consumption declined in the year under review, the consumption of other classes of rice shewed a marked increase.

The total quantity of rice products imported for local consumption in 1937, including bran, rice flour and rice meal of which 179,188 tons, valued at $5,099,816 were imported, amounted to 752,246 tons valued at $43,310,804 as compared with 670,731 tons, valued at $35,955,855 in 1936. The net imports of padi, which amounted to 5,237 tons, valued $219,447, are not included in these figures.

Area and Yields.*

The area planted with "wet" padi in the season 1936-37 was 693,550 acres, constituting a record. Of this increase over the previous year of over 18,600 acres, the Federated Malay States were responsible for over 8,000 acres, Kedah 2,000 acres, Kelantan 7,000 acres. In other parts of the country the area planted was about the same as in the previous season.

All States in the Federation contributed an increased acreage, the increase being most pronounced in Pahang. While the Kelantan figures of area are considerably greater than those of 1936, it is admitted that it is extremely difficult to estimate areas in this State and the figures are, therefore, of doubtful value.

The production of padi from the Federated Malay States was about 2,000,000 gantangs greater in the season under review than in the previous season, but in view of the increased acreage in 1937, the yield per acre was less favourable. The position in the Straits Settlements calls for no comment, acreage and production in 1937 being about the same as in the previous year.

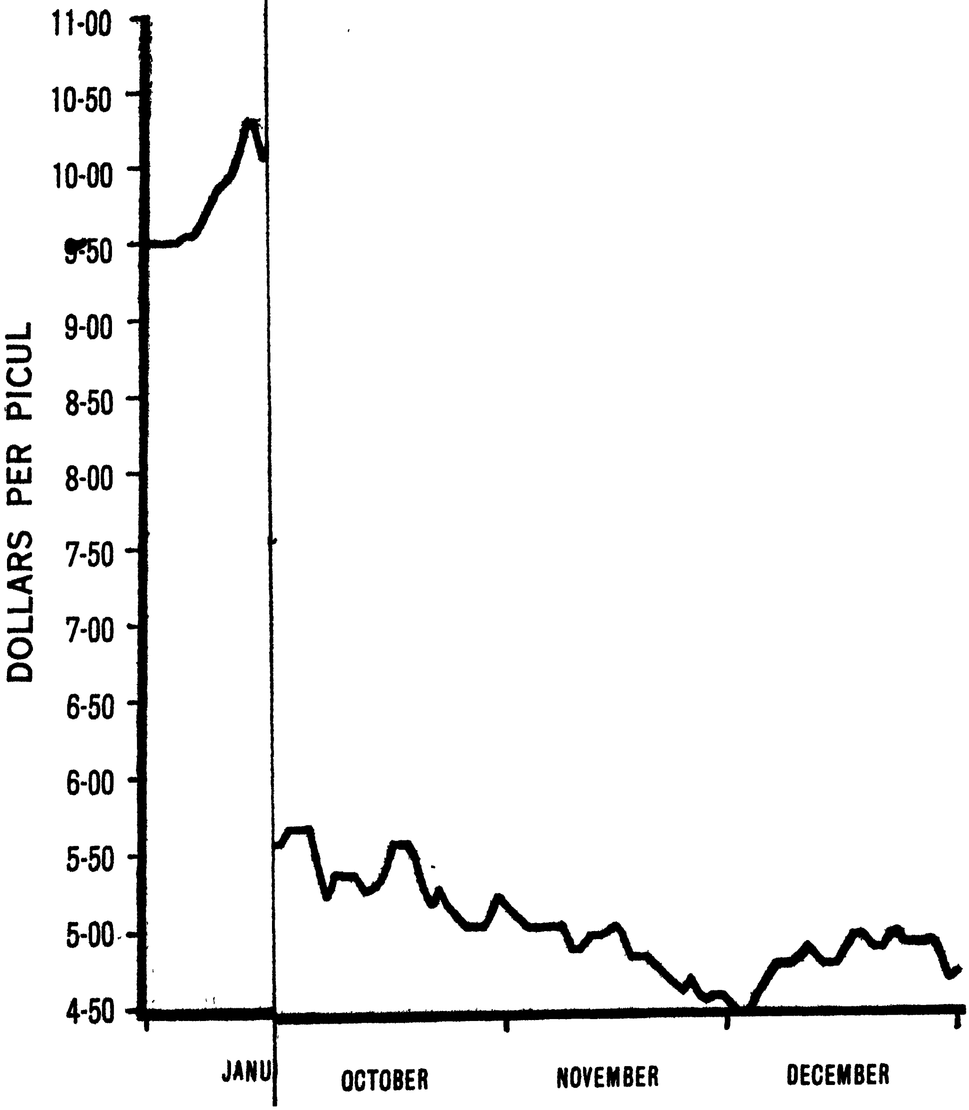
The most marked decline is shewn by the Unfederated Malay States, where in 1937, despite an increased acreage of 9,000 acres, the total crop of "wet" padi harvested was 15,500,000 gantangs (equal to 28,000 tons of rice) less than in 1936. The main centres of this decrease were Kedah and the neighbouring small State of Perlis, the former State obtaining 14,000,000 gantangs less and the latter State 1,600,000 gantangs less than in 1936.

The decline in yields is ascribed mainly to seasonal variation, the season being less favourable for the crop. In addition, Kedah reports state that over 9,000 acres were affected by pests, disease and inundation by sea water, and over 600 acres by drought which resulted in a total loss of crop on 400 acres.

A summary of the areas and production of padi for the past eight seasons is given in Table III.

* Estimating the area and yields of padi presents great difficulty, and the following figures are therefore given with due reservations.

t to
Malayan Agricultural Journal, February 1938.



K. P. & Co., Ltd.

Table III.

Areas and Yields of Padi.

Year	"Wet" Padi			"Dry" Padi			Total	
	Area Acres	Yield Gantangs	Gantangs Per Acre	Area Acres	Yield Gantangs	Gantangs Per Acre	Area Acres	Yield Gantangs
1929 - 30	629,650	103,624,000	164	27,550	3,160,000	114	657,200	106,784,000
1930 - 31	603,070	166,845,000	277	104,670	9,122,000	87	707,740	175,967,000
1931 - 32	635,130	184,631,000	291	89,850	12,472,000	139	724,980	197,103,000
1932 - 33	674,920	186,345,000	276	91,990	13,416,000	146	766,910	199,761,000
1933 - 34	691,110	215,098,000	311	74,140	9,389,000	127	765,250	224,487,000
1934 - 35	669,290	213,835,000	319	65,440	6,720,000	106	734,730	220,555,000
1935 - 36	674,900	219,786,000	325	50,150	8,087,000	161	725,050	227,873,000
1936 - 37	693,550	206,256,000	297	46,490	6,354,000	137	740,040	212,610,000

(Acreage to nearest 10 acres: yields to nearest 1,000 gantangs)

Table IV.

Area of Land Planted in Malaya and Yield of Rice.

Season	F.M.S.		S. S.		U.M.S.		Total	
	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons
1929 - 30	174,466	55,577	67,005	25,944	415,727	78,815	657,198	160,335
1930 - 31	178,930	57,027	67,350	39,503	461,460	167,672	707,740	264,202
1931 - 32	194,580	67,658	67,980	39,626	462,420	188,664	724,980	295,948
1932 - 33	214,160	76,331	70,530	36,051	482,220	187,539	766,910	299,921
1933 - 34	195,690	78,835	70,550	44,180	499,010	214,053	765,250	337,068
1934 - 35	176,750	79,559	68,500	43,988	489,480	207,617	734,730	331,164
1935 - 36	178,020	78,011	67,750	37,818	479,280	226,321	725,050	342,150
1936 - 37	185,730	80,872	69,090	37,622	485,220	200,740	740,040	319,234

(Yield estimated on a basis of 666 gantangs of padi = 1 ton of rice)

Table V.

Area of Land Planted in Malaya and Yields of Padi.

Season 1936-1937.

State or Territory	Wet		Dry		Total	
	Acres	Gantangs	Acres	Gantangs	Acres	Gantangs
F.M.S.—						
Perak ...	93,110	30,169,000	1,980	283,000	95,090	30,452,000
Selangor ...	19,980	5,224,000	410	83,000	20,390	5,307,000
N. Sembilan ...	34,370	10,779,000	20	4,000	34,390	10,783,000
Pahang ...	35,210	7,195,000	650	124,000	35,860	7,319,000
Total ...	182,670	53,367,000	3,060	494,000	185,730	53,861,000
S.S.—						
P. Wellesley ...	32,500	11,202,000	300	60,000	32,800	11,262,000
Malacca ...	32,310	12,275,000	—	—	32,310	12,275,000
Penang ...	3,980	1,519,000	—	—	3,980	1,519,000
Total ...	68,790	24,996,000	300	60,000	69,090	25,056,000
U.M.S.—						
Johore ...	8,030	1,468,000	880	88,000	8,910	1,556,000
Kedah ...	246,310	81,854,000	1,710	364,000	248,020	82,218,000
Perlis ...	41,870	10,519,000	—	—	41,870	10,519,000
Kelantan ...	113,110	26,811,000	29,800	4,301,000	142,910	31,112,000
Trengganu ...	32,770	7,241,000	10,740	1,047,000	43,510	8,288,000
Total ...	442,090	127,893,000	43,130	5,800,000	485,220	133,693,000
TOTAL MALAYA ...	693,550	206,256,000	46,490	6,354,000	740,040	212,610,000

Note:— Acreage to the nearest 10 acres. Yield to the nearest 1000 gantangs.

Consumption Compared with Production.

The greater prosperity of the country in 1937 as compared with the previous year has been responsible for an influx of Indian and Chinese labour into Malaya and therefore an increased consumption of rice, which has to be met by increased imports of this food. Thus, with local harvests at normal, the percentage of production to net imports declines to 56 as compared with 64 in 1936, while the percentage of production to consumption declines to 36 from 39 in 1936.

In view of the present position of Malaya's two great industries which leads one to anticipate that there will be no considerable immigation in 1938, and on present crop prospects in this country, it is probable that the percentage of production to consumption in 1938 should be slightly more favourable than it has been for the past two years.

Table VI.

Malayan Production of Rice in Relation to Net Imports and Consumption 1930-1937.

	1930	1931	1932	1933	1934	1935	1936	1937
Net imports (tons) ...	591,755	515,727	409,000	433,166	453,229	474,955	533,795	573,063
Production (tons) ...	160,335	264,202	295,948	299,921	337,068	331,164	342,150	319,234
Consumption (tons) ...	752,090	779,929	704,948	733,087	790,297	806,119	875,945	892,297
Percentage of production to net imports ...	27	51	72	69	74	69	64	56
Percentage of production to consumption ...	21	34	42	41	43	41	39	36

Acknowledgments.

The Field Branch of the Department of Agriculture, in collaboration with the Land Officers, were responsible for the estimates of areas and yields as summarized in Table V. The figures for imports and exports, and values thereof, are obtained from the Monthly Summaries of Imports and Exports, published by the Statistics Department, Straits Settlements and Federated Malay States, and are subject to minor adjustments at a later date.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

4th Quarter, 1937.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department.

Rainfall.

As usual in the last quarter of the year, rainfall was heavy, but reports indicate that it was extremely irregular. In nearly all parts of the Peninsula October was a very wet month with rainfall above average, though parts of Negri Sembilan and the north districts of Kedah experienced dry conditions. December was abnormally dry in several States, notable exceptions being Johore, Malacca and Kedah.

Prices and Production.

Tables I and II summarize prices paid for small-holders' rubber during the quarter, and Table III shews production during the year in comparison with 1936. The prices are tabulated from records collected at a number of centres in each State. The table of production is compiled from the monthly reports of production, stocks, imports and exports of rubber, published by the Registrar-General of Statistics, S.S. and F.M.S.

Prices of coupons were low in the first two months of the quarter but rose considerably in December when presumably dealers had to cover heavy purchases of uncouponed rubber. In Perak North coupons rose by \$3 to \$15.80 per picul equivalent. In Perak South the increase was much more marked, from \$10 to \$15—\$18 in December. Province Wellesley reported \$13 in December as compared with \$7 at the end of November, and Malacca \$17 to \$18 at the close of the quarter whereas coupons were practically unsaleable in October and November.

Tapping and Condition of Holdings.

The results of the quarterly survey of small holdings out of tapping are tabulated in Table IV, and a summary and comparison with previous quarters appear in Table V. The area of small holdings out of tapping is estimated by counting the number of holdings not tapping in a certain area and applying the percentage to the total area of small holdings in the relative District.

It will be seen that the area out of tapping increased in certain districts during the quarter under review, and this increase was due principally to the wet weather which rendered tapping impossible, and also to the Hari Raya festivities.

The weather was also responsible for the cessation of clearing of undergrowth and lalang.

Reports indicate that the generally improved conditions of small holdings are being maintained, particularly with regard to disease control and care of utensils. Small-holders, both Malay and Chinese, respond well to the advice of the Asiatic Rubber Instructors.

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

4th Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				OCTOBER				
Smoked sheet	33.00-35.00	27.00-36.00	30.00-36.00	28.00-37.00	27.00-36.50	29.50-32.00	29.50-40.00	29.00-36.60
Unsmoked sheet	28.00-33.00	24.00-34.00	20.00-32.00	25.00-36.00	24.00-35.50	28.00-30.00	26.00-35.50	24.00-35.60
Scrap	12.00-25.00	17.00-22.00	18.00-23.00	—	18.00-21.00	19.50-23.00	16.00-24.50	14.00-23.00
				NOVEMBER				
Smoked sheet	27.50-32.00	25.00-32.30	26.00-31.00	25.00-32.70	24.00-30.20	28.00-33.00	26.50-31.00	23.00-31.00
Unsmoked sheet	25.00-31.00	21.00-32.50	19.00-28.40	22.00-28.00	22.00-29.00	27.00-31.50	24.00-30.00	22.00-29.50
Scrap	14.00-20.00	14.00-22.00	14.00-18.00	—	16.00-17.70	17.50-21.00	16.00-23.00	13.50-19.00
				DECEMBER				
Smoked sheet	28.00-33.00	26.00-31.25	26.50-32.25	26.00-31.50	24.00-35.10	28.50-32.00	28.00-32.50	24.00-31.20
Unsmoked sheet	27.00-30.00	23.00-29.25	22.00-29.25	20.00-30.00	22.00-29.50	26.00-29.50	23.00-30.00	22.00-30.45
Scrap	16.00-21.00	15.00-22.00	15.00-20.00	—	16.00-18.00	15.50-23.00	16.00-23.50	16.00-22.70

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul (133 1/3 lbs.))

4th Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
OCTOBER								
Smoked sheet	33.00-34.60	29.57-33.65	31.25-33.58	30.20-36.16	28.30-34.10	30.17-31.50	29.70-34.10	30.06-33.79
Unsmoked sheet	29.38-33.00	26.09-29.91	25.50-29.00	26.90-33.60	25.75-30.81	28.50-29.50	26.50-31.50	29.70-31.66
Scrap	18.25-21.12	17.67-20.00	18.67-21.00	—	18.00-21.00	20.66-21.50	18.12-23.12	17.41-20.00
NOVEMBER								
Smoked sheet	28.83-30.50	26.48-28.70	27.13-30.18	26.20-30.82	26.58-29.05	29.17-30.66	27.00-29.90	26.59-28.93
Unsmoked sheet	25.75-29.25	23.15-26.10	23.50-26.10	23.40-27.10	23.63-26.88	27.50-29.17	24.88-27.62	24.40-27.05
Scrap	15.50-18.25	16.00-20.00	15.33-18.00	—	16.00-17.70	18.83-19.83	17.75-21.25	15.28-17.08
DECEMBER								
Smoked sheet	29.00-31.33	27.53-29.58	27.92-30.24	27.42-31.10	27.42-30.30	29.50-30.66	28.80-31.30	26.66-29.64
Unsmoked sheet	27.75-29.75	24.47-26.71	24.75-27.44	23.70-28.76	25.18-27.25	27.17-28.33	25.75-29.00	24.84-28.25
Scrap	17.25-19.25	17.33-20.33	16.67-19.67	—	16.00-18.00	18.83-20.17	19.25-22.62	17.53-20.74

Table III.

Production of Rubber on Small Holdings

(in tons)

	Total Year 1936	1st Quarter 1937	2nd Quarter 1937	3rd Quarter 1937	4th Quarter 1937	Total Year 1937
Federated Malay States	62,596	19,764	19,975	26,253	25,142	91,134
Unfederated Malay States	56,759	19,310	18,568	21,446	21,281	80,605
Straits Settlements	12,532	3,769	4,198	4,727	4,036	16,730
Total ...	131,887	42,843	42,741	52,426	50,459	188,469

Owner tappers are taking advice on better systems of tapping, but difficulties are encountered when owners will not adequately supervise paid labour, particularly where work is given to poorer relations.

It has been evident for some time that considerably more attention is now being paid to tapping methods and quality of tapping on small holdings, and this improvement is particularly noticeable on the medium-sized holdings of Chinese ownership. The tapping on such holdings is often equal to the standard of estate practice, and it is possible that in many cases the owners have gained their knowledge while employed on large estates, in addition to benefitting from the practical demonstrations of the Asiatic Rubber Instructors.

Diseases.

The wet weather was responsible for considerable outbreaks of Mouldy Rot, but these were successfully kept under control, and large quantities of approved disinfectants were distributed through the Department of Agriculture. In Perak North, lectures and demonstrations on the control of Mouldy Rot were given with satisfactory attendances and results. The Perak South report points out that the Hari Raya festivities were responsible for the more than usual seasonal increase in this disease, as many small-holders required ready cash and tapped their trees under unfavourable weather conditions.

Sporadic outbreaks of Pink Disease were reported in Pahang.

Root disease was reported from every district in the Johore North Circle and is mentioned in several other reports.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of December, 1937.

PERAK

strict	Total Tappable area	Total area untapped	Percentage
Padang	36,187	3,300	9
	38,874	2,300	6
Kangsar	92,166	11,100	12
Perak	15,590	3.400	22
Selama	43,132	3,900	9
	9,408	2,000	21
Perak*	26,735	3,500	13
gs	9,873	7,000	71
	271,965	36,500	13

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang†	16,143	2,600	16
Kuala Langat†	23,881	3,800	16
Ulu Langat	45,012	6,300	14
Ulu Selangor	31,463	4,700	15
Kuala Lumpur	20,277	4,700	23
Kuala Selangor†	8,417	1,300	16
	145,193	23,400	16

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	23,639	12,500	53
Tampin	21,896	13,800	63
Kuala Pilah	31,832	12,100	38
Jelebu	9,097	1,000	11
Port Dickson	11,133	5,600	50
	97,597	45,000	46

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	10,534	1,700	16
Kuala Lipis	15,457	500	3
Bentong	12,224	1,700	14
Other Districts†	46,373	5,600	12
	84,588	9,500	11
JOHORE	350,007	50,000	16
KEDAH	102,126	11,200	11
PERLIS	2,916	13,100	16
KELANTAN & ‡	49,133		
TRENGGANU	29,836		

MALACCA

trict	Total Tappable area	Total area untapped	Percentage
	14,093	1,500	11
jah	30,838	1,200	4
	25,286	3,300	13
	70,217	6,000	9

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,549	100	3
Central	10,785	2,500	23
South	8,936	800	9
Penang	15,822	1,700	11
	39,092	5,100	13

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	20,115	2,000	10
	20,115	2,000	10

The percentage of areas out of tapping in September, 1937, was as follows:—Perak 13, Selangor 14, Negri Sembilan 36, Pahang 9, Malacca 8, Penang and Province Wellesley 10, Singapore 3, Johore 8, Kedah 10.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.
Comparison of Areas of Rubber Small Holdings Out of Tapping.

	December, 1936		September, 1937		December, 1937	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S.	202,600	37.5	96,100	16.0	114,400	19.1
S. S.	22,200	18.0	10,200	7.9	13,100	10.1
U.M.S	134,500	26.6	42,800	7.9	74,300	13.9
Malaya	359,300	30.8	149,100	11.7	201,800	16.0

In Johore North special demonstrations have been given by the Asiatic Rubber Instructor in the use of chemicals for the control of "white ants". Control measures were also introduced in Raub (Pahang).

General.

The Perak North report stated that there had been a good demand for scrap during the quarter.

In Perak South one smoking-cabinet was completed during the quarter, and three others commenced in October were unfinished.

Budded small holdings in Batang Padang (Perak South) have had earlier failures rebudded with satisfactory results in most cases.

In Negri Sembilan part of a 50 acre holding has been cut out for replanting.

Selling on co-operative lines in Temerloh District (Pahang) was continued with success during the quarter. Some grading was done by the Asiatic Rubber Instructor in Raub.

In Pahang, 43 new smoke cabinets were erected during the quarter, making a total of 166 in the State, of which practically all were in constant use. Consequent on increased quantities of smoked sheet being prepared, dealers in Raub dropped the premium for smoked sheet from $1—$3 to 50—80 cents in order to try to stop the loss of their smoking trade.

The Rubber Dealers' Scheme in Pahang is reported to continue to work satisfactorily, but constant supervision is necessary.

General economic conditions on small holdings were fair during the quarter. Despite declining prices small-holders were able to sell large quantities of uncouponed rubber at steady prices which helped to maintain a reasonable standard of living. The sale of uncouponed rubber often means extra labour for tapping, thus creating a market for casual labour.

Reviews.

A Review of the Literature on Stock-Scion Incompatibility in Fruit Trees, with particular reference to Pome and Stone Fruits.

By G. K. Argles, Technical Communication 9 of the Imperial Bureau of Fruit Production, East Malling, Kent, England, 1937, pp. 113, bibl. 194. Price five shillings.

The problem of incompatibility has loomed ever larger with the increasing realization of the advantages to be gained by the use of tested clonal rootstocks for the production of uniformly excellent fruit.

The literature on the subject is considerable, but it is scattered over very many journals, bulletins and books, and is not always easy to follow. In it the term "incompatibility" is used extremely loosely and may mean much or little. The author here briefly summarizes the phenomena which occur as the result of slight or pronounced incompatibility in different stock-scion combinations.

The horticulturist is often faced with the problem of growing varieties of fruit in localities where there is no experience to guide him. If he knows that under certain conditions, which may in some respects resemble his own, certain rootstocks have given promising results with particular varieties, at least he has something on which to base his trials. He would be most unfortunate if, as regards the common deciduous tree fruits of commerce, he did not find some guidance in these pages.

The physiologist, moreover, has in this common feature of practical horticultural practice a unique investigational field at his disposal. The author gives him a firm basis on which to work.

First the manifestations or symptoms of incompatibility in fruit trees are considered and their possible causes discussed. Next the compatibility or incompatibility shewn by individual varieties of common deciduous fruit trees in respect of particular rootstocks is noted, considerable attention being paid to the practical field experience of research workers in different parts of the world with particular scions and rootstocks.

Certain general conclusions are drawn with regard to both the symptoms and the cause of inherent incompatibility, and tentative suggestions are made for drawing up a research programme to investigate the problem.

In an appendix covering 40 pages are tabulated the many and often contradictory records of compatibility and incompatibility between particular rootstocks and particular varieties. They should prove helpful not only to the physiological investigator but also to the practical horticulturist.

Manual of Rubber Planting (Malaya).

Compiled by A. T. Edgar, A.I.S.P. Published by the Incorporated Society of Planters, Kuala Lumpur, F.M.S., 1937, 411 pp. Illustrated. Price $8 (Straits Currency).

The literature on rubber planting is extensive and somewhat diffuse; the compilation of a connected account of present-day methods, therefore, must have been a task of some magnitude, and planters in Malaya should be grateful to the compiler, Mr. A. T. Edgar, and to the publishers, The Incorporated Society of Planters, for the addition to rubber-planting literature of this Manual of Rubber Planting.

Mr. Edgar is a practical rubber planter, a fact which is evident from his selection of material and the form of its presentation to the reader. He has drawn freely from the publications of the Rubber Research Institute of Malaya with the result that in Part I we are given an authoritative exposition supported by the compiler's personal experience.

In the compass of about 300 pages an account is given of the process of rubber planting, from selection of the land to preparation of the rubber in the factory. This constitutes Part I of this volume, divided into twelve convenient sections. The subjects treated are land tenure, choice of land and opening up; cover crops, planting, budgrafting, seed selection and breeding, maintenance of young clearings and of old rubber, tapping, pests and diseases, manuring old rubber, replanting, collection and preparation, and preservation of latex for export.

Senior planters are probably fully informed on the subjects dealt with in this book; nevertheless, both they and their juniors should find the book useful for reference purposes. Its use in this connexion, however, would have been enhanced by the inclusion of a bibliography of up-to-date literature on rubber planting. Provision has been made for the issue from time to time of supplements to the volume. Perhaps the compiler will use this means of adding a comprehensive bibliography.

The main purpose of the Manual is to serve as a text book under the Technical Education Scheme of the Incorporated Society of Planters, and for this purpose Part I should be admirably suited.

Part II is a collection of articles on a number of subjects connected with the duties of a planter, and therefore lacks the completeness of Part I. Each of the thirteen sections of Part II deals with a particular aspect of planting. Perhaps the most interesting are "Some Notes on Estate Sanitation for Planters," and "Timbers of Malaya;" but the other subjects, treating with housing, labour, co-operative societies, estate records, concrete, notes on buildings, surveying instruments and equipment, roadmaking and rainfall are most informative.

The compiler has approached his subject from many angles and the result is an informative volume of value to the reader for whom it was compiled.

D. H. G.

The M.A.H.A. Magazine.

Published quarterly by the Malayan Agri-Horticultural Association, Kuala Lumpur, F.M.S. Price $1.20 per annum, post free.

The first number of Vol. VIII of *The M.A.H.A. Magazine*—the official organ of the Malayan Agri-Horticultural Association—has recently appeared. The magazine makes a strong appeal to garden lovers, the present number containing six articles on horticulture. In view of the fact that this publication is the official organ of both the Selangor and Singapore Gardening Societies, it cannot be held that 25 pages devoted to horticulture of a total of 46 pages is giving too much attention to gardening. While there are several Malayan periodicals concerned with agriculture in its various aspects, *The M.A.H.A. Magazine* is the only local publication in which a section is devoted to horticulture.

Although horticulture figures so prominently, the pages of *The M.A.H.A. Magazine* are open to many other subjects of interest, and in looking through the past year's issues, interesting articles are found on such widely different subjects as poultry, arts and crafts, painting, nutrition, cookery, and insects. The Association gives good value for the very modest subscription and the magazine is deserving of a large circulation.

D. H. G.

FERTILIZER PRICES, JANUARY, 1938.

The following are the prices at the end of January, 1938, of some of the more important fertilizers. All quotations are *ex* Port Swettenham, F.M.S., or Singapore.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5) Soluble	Phosphoric Acid (P_2O_5) Insoluble	Potash (K_2O)	
Sulphate of Ammonia ...	20	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	50.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

January, 1938.

The Weather.

The first three weeks of January were an exceptionally dry period throughout the Peninsula. The rainfall was considerably below the average for the month at all stations except Singapore, where precipitation was only slightly below normal, and a north-easterly breeze prevailed. There were occasional thunderstorms in many localities towards the end of the month with heavy rainfall of short duration.

Remarks on Crops.

Rubber.—The market opened after the New Year holidays at a slightly lower figure than the December quotations but remained fairly steady at from about $28 to $29 a picul for smoked sheet. In all parts except Johore Bahru the price of coupons appreciated further and the prices offered for uncouponed rubber declined. The quotations for coupons ranged between $14 and $20 per picul equivalent. At Johore Bahru, however, the quotations for coupons were slightly lower than for last month whilst quotations for uncouponed rubber ranged between $10 and $12 per picul as compared with $4 to $5 for December.

The erection of seven more smoke cabinets in Brunei has brought the total to 219.

The Licensing Board of Batang Padang, Perak, have required all dealers within the District to display price boards and samples of grades 1 to 5 of smoked sheet with effect from February 1st An attempt is being made to obtain from the 59 dealers concerned a census of the amounts of the different grades of rubber dealt in during 1937, to serve as a standard for comparison with transactions during the current year.

Padi.—The general review given last month remains substantially correct. In the Selangor report mention is made of the improvement effected by irrigation in the Berangan area where the crop promises to be much better than last year and the area planted is 1,200 acres as compared with 330 acres last season.

Reports of empty and poorly-filled ears have been received from Kedah, North Province Wellesley, the Sega area of Raub District of Pahang, and the Rembau-Tampin Districts of Negri Sembilan. The causes of failure to "set" grain are obscure, but it is significant that the incidence of the trouble is specially noticeable in a season characterized by scarcity of rainfall during a portion of the growing period and an exceptionally dry period, in respect of both low rainfall and a comparatively drying wind, during flowering and the later stages of the plants' growth. Investigations at Linggi in Malacca, where empty ears have been a noticeable

phenomenon every season for many years, have revealed that thrips are present on the padi panicles, but further investigation will be necessary before it can be determined whether or not the thrips have any direct connexion with the empty ears. Observations would seem to indicate that the occurrence of empty ears is connected, in at least some instances, with some as yet undetermined unsuitability of either soil or water or both. On the other hand, a pot experiment in a greenhouse is on record which demonstrated that a dry atmosphere is detrimental to the fertilization of padi. These particulars are recorded as a guide to observers in areas where an unusual proportion of empty ears are produced.

Agricultural and Padi Stations.

There is little of special interest to record under this heading. At Cheras Agricultural Station half the cinnamon trees were coppiced some time ago and the bark subsequently prepared was marketed during the month. A Kuala Lumpur firm reported very favourably on the product and said it was superior to the imported product and that they would be prepared to take a fair quantity of the Malayan product if available. Harvesting was in progress at many Padi Stations.

CORRECTION.

From the Districts, January 1938, page 38, table of poultry weights. **Batch 3 should read "total chickens, 36, average weight 1 lb. 5 ozs."**

DEPARTMENTAL NOTES

Visit of Sir Frank A. Stockdale, K.C.M.G., C.B.E.

Sir Frank A. Stockdale, Agricultural Adviser to the Secretary of State for the Colonies, arrived in Penang on the 28th January 1938, on an official visit to Malaya of about one month.

Appointment.

Mr. P. V. Ormiston, B.A. (Cantab.) has been appointed to be an Agricultural Officer, Department of Agriculture, Straits Settlements and Federated Malay States, with effect from 3rd January 1938.

Leave.

Mr. C. H. Burgess, Agricultural Officer, has been granted 179 days leave from 4th January 1938 to 11th July 1938 inclusive.

Mr. J. W. Jolly, Agricultural Officer, has been granted 240 days leave from 15th January to 11th September 1938 inclusive.

Mr. Gunn Lay Teik, Assistant Analyst, returned from leave on 13th January 1938.

Mr. J. H. Dennett, Senior Chemist (Soils), returned from leave on 23rd January 1938.

Mr. A. Thompson, Plant Pathologist, returned from leave on 28th January, 1938.

Statistical.

MARKET PRICES.

January, 1938.

Major Crops.

Rubber.—The market remained at a low level throughout the month, and though prices improved slightly in the second half of the month, this tendency disappeared at the close when the market was again falling.

Spot loose in Singapore opened at $22\frac{3}{4}$ cents per lb., and after immediately falling to $21\frac{3}{4}$ cents improved to $24\frac{1}{8}$ cents on the 26th, weakening again to close at 23 cents.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 23.08 cents per lb. as compared with 24.16 cents in December. The London average price was 7.07 pence per lb., and the New York price 14.54 cents gold, as compared with 7.27 pence and 14.97 cents gold in December.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, January, 1938.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	6	13	20	27	5	12	19	26	5	12	19	26
Smoked sheet	27.25	28.00	28.00	28.50	26.00	28.00	27.00	28.50				
Unsmoked sheet	26.64	25.95	26.76	27.30	23.57				24.00	24 70	25.00	26.50
Scrap	18.00	19.00										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—There was no change in the market for Malayan palm oil but kernels fell in the second half of the month. January prices are given in Table II.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
January	7	£ 17. 0. 0	£ 10. 10. 0
,,	14	17. 0. 0	10. 10. 0
,,	21	17. 0. 0	10 7. 6
,,	28	17. 0. 0	10. 0. 0

Copra.—The copra market in Singapore fell very heavily during January, weakening to $4 per picul in the last week of the month. The sun-dried grade opened at $4.75 per picul, and after the 12th January fell steadily, reaching $4 on the 27th and 28th, and closing at $4.05.

The average price for the month for the sun-dried grade was $4.41 per picul and for the mixed grade $4.05, as compared with $4.81 and $4.54 respectively in December.

Copra cake remained unchanged at $1.80 per picul as compared with $2.15 in December.

Rice.—The average wholesale Singapore prices of rice per picul in December were as follows:—Siam No. 2 (ordinary) $4.14; Rangoon No. 1 $3.95; Saigon No. 1 $3.97; as compared with $4.12, $3.92 and $3.82 in November, and with $4.35, $3.47 and $3.92 in December 1936.

The average wholesale prices for the year were respectively $4.39, $3.75 and $3.92, as compared with $3.86, $3.44 and $3.59 for the year 1936.

The average retail prices in cents per gantang of No. 2 Siam rice in December were:—Singapore 28, Penang 36, Malacca 29, as compared with 29, 36 and 32 respectively in November. The average retail prices for the year were 30, 36 and 32 respectively.

The average declared trade value of imports during December was $3.98 per picul as compared with $4.09 in November and $4.09 in October. The average for the year was $4.00 as compared with $3.58 for the year 1936.

Padi.—The price of padi at the Government Rice Mills, Perak, continued at $2 per picul. Retail prices of padi ranged from 6 to 16 cents per gantang.

Pineapples.—Prices per case continued unchanged in Singapore, and were: G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and $2.95 respectively.

Prices of fresh fruit per 100 were as follows:—Selangor 40 to 52 cents; Singapore 70 cents to $1.10; Johore 1st quality 60 to 80 cents, 2nd quality 45 to 55 cents, 3rd quality 30 to 40 cents.

Beverages.

Tea.—Seven consignments of Malayan tea were sold on the London market during January. Three consignments were of upland tea and were sold at 1s. 2d. and 1s. 2¼d. per lb. The lowland tea was sold at prices ranging from 1s. 0½d. to 1s. 1¾d. per lb.

Average London prices per lb. during January for consignments of tea from other countries were as follows:—Ceylon 1s. 3.52d., Java 1s. 0.72d., Indian Northern 1s. 2.07d., Indian Southern 1s. 2.24d., Sumatra 11.54d.

The latest Colombo average prices available quoted from *The Weekly Tea Market Report,* 25th January 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 83 cents, Medium Grown Teas 72 cents, Low Grown Teas 66 cents.

Coffee.—Prices remained relatively unchanged during January, and were (per picul):—Sourabaya $13.12 to $14.12; Palembang $10.25 to $10.94.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian $14; Excelsa $9, improving to $10 but closing at $9; Robusta $7 rising to $8, falling to $7 in the second half of the month.

Spices.

Arecanuts.—The range of Singapore average prices per picul during January was as follows:—Splits $5.10 to $7.65; Red Whole $6 to $9.25; Sliced $5.19 to $6.31.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $7.80, Medium $7.35, Mixed $7.05.

Pepper.—The price of Singapore Black improved by 25 cents per picul at the close to average $8.05 for the month. Singapore White and Muntok White were unchanged at $13.50 and $14 per picul respectively.

Nutmegs.—The Singapore market weakened at the close of the month; the average price for 110's and 80's was $41.40 per picul as compared with $41 in December.

Mace.—Prices fell again in the second half of January and averages per picul for the month were Siouw $98, Amboina $82, as compared with $105 and $86.50 in December.

Cloves.—Quotations remained nominal at $40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for January at Rs. 1.20 to Rs. 1.50, closing at Rs. 1.15 to Rs. 1.52 per lb.

Miscellaneous.

Derris (Tuba Root).—Lack of buying interest in overseas markets weakened prices still further. Roots sold on rotenone content averaged $25 per picul, and on ether basis $15, as compared with $26 and $16 respectively in December.

Gambier.—Block fell from $8 to $7.75 per picul at the close, averaging $7.90 for the month, while No. 1 Cube improved to $16 per picul at the close, averaging $15.60. The December average prices were $8 and $15.50 per picul respectively.

Tapioca.—Seed Pearl and Medium Pearl continued unchanged at $4.80 and $5.20 per picul respectively, while Flake Fair weakened slightly in the second half of the month to $4.25, but recovered to close at $4.50, with an average of $4.45 per picul, as compared with $4.50 in December.

Sago.—Pearl, Small Fair, was quoted throughout the month at $4.25 per picul as compared with an average price of $4.11 in December. Flour, Sarawak Fair, averaged $2.44 per picul as compared with $2.46 in the previous month.

Tobacco.—The range of prices per picul for dried leaf was:—1st quality $27.35 to $48, 2nd quality $16.50 to $42, 3rd quality $8 to $34. Prices of prepared tobacco were:—Kelantan $95; $80; $60; Negri Sembilan $62; $58; $45. In Johore Java tobacco was quoted at $10 to $140 per picul

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

December, 1937.

Malaya.—Imports of foreign rice during December were 61,274 tons† and exports 19,914 tons, net imports being 41,360 tons as compared with 45,063 tons in 1936. Net imports for the year 1937 totalled 578,068 tons as compared with 533,795 tons in 1936.¶

Of the imports during December, 48 per cent. were consigned to Singapore, 18 per cent. to Penang, 9 per cent. to Malacca, 17 per cent. to the Federated Malay States, and 8 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 38,071 (62.1), Burma 19,816 (32.3), French Indo-China 2,745 (4.5), other countries 642 (1.1).

Of the exports during December, 60 per cent. were consigned to the Netherlands Indies, and 40 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 16,437 (82.5), Burma 2,557 (12.9), French Indo-China 871 (4.4), parboiled 26 (0.1), local production 23 (0.1).

India and Burma.—Foreign exports during January to November totalled 675,000 tons as compared with 1,246,000 tons in 1936, a decrease of 45.8 per cent. Of these exports 3.9 per cent. were to the United Kingdom, 5.6 per cent. to the Continent of Europe, 29 per cent. to Ceylon, 21 per cent. to the Straits Settlements and the Far East, 40.5 per cent. to other countries. The corresponding 1936 percentages were 3.7, 15.1, 29.8, 22.1 and 29.3.

According to the second rice forecast (*Indian Trade Journal*, 30th December 1937) for the 1937-38 season for All-India, the area under rice is estimated at 68,807,000 acres, an increase of 1 per cent. over the 1936-37 season. The condition of the crop is, on the whole, good.

According to the third forecast of the rice crop in Burma for the season 1937-38, the area likely to mature is estimated at 12,517,200 acres, an increase of 409,300 acres, or 3.4 per cent. as compared with the final figures for the last season.

The district reports indicate that the yield in both Lower and Upper Burma will be distinctly better than last season in most districts, and but for the untimely rain in December the crop would have undoubtedly been a good one. Both the sown and matured areas are notably higher than both the actuals and the corresponding estimate of last season. It is at present anticipated that the condition figure for Lower Burma will be 7 points higher than last season, and for Upper

* Abridged from the Rice Summary for December 1937 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

Burma 4 points higher. The exportable surplus is at present estimated at 3,450,000 tons of rice and rice products, which may be taken as equivalent to 4,662,000 tons of padi.

Siam.—Exports of rice and rice products from Bangkok during October and November were respectively 57,668 and 72,378 tons. The cumulative total for the year was 850,448 tons as compared with 1,503,385 tons in 1936.

According to the first forecast of the rice crop of Siam for the season 1937-38, received from His Majesty's Consul at Bangkok, the total planted area is estimated at 8,200,000 acres, and the area damaged at 920,000 acres. The total yield is calculated at 4,658,333 tons of padi. The surplus available for export, including carry-over from the previous year, is estimated by the Department of Commerce at 2,113,095 tons of padi, equivalent to 1,583,333 tons of rice and rice products.

Japan.—The latest information available was published in the October Summary.

French Indo-China.—Entries of padi into Cholon from the 1st January to the 15th December totalled 1,352,955 tons, as compared with 1,455,046 tons in 1936, a decrease of 7 per cent. Exports of rice during the same period were 1,471,190 tons as compared with 1,664,442 tons in 1936, a decrease of 11.6 per cent.

The Netherlands Indies.—The latest information available was published in the October Summary.

Ceylon.—Imports of rice for the year 1937 were 515,932 tons as compared with 520,939 tons in 1936, a decrease of 1 per cent.

Of the 1937 imports 17.2 per cent. were from British India, 70.2 per cent. from Burma, 0.6 per cent. from the Straits Settlements and 12 per cent. from other countries. The corresponding 1936 percentages were 14.1, 63.2, 0.4 and 22.3.

Europe and America.—Shipments from the East to Europe from the 1st January to the 2nd December totalled 1,058,783 tons as compared with 1,262,461 tons in 1936, a decrease of 16.1 per cent. Of the 1937 shipments 40.2 per cent. were from Burma, 53.8 per cent. from Saigon, 4.4 per cent. from Siam, and 1.6 per cent. from Bengal. The corresponding percentages for 1936 were 23.9, 66.1, 9.3 and 0.7.

Shipments to the Levant from 1st January to 4th November aggregated 16,218 tons as against 13,541 tons in 1936, an increase of 19.8 per cent. Shipments to Cuba, West Indies and America from 1st January to 22nd November totalled 218,207 tons as compared with 235,657 tons in 1936, a decrease of 7.4 per cent.

MALAYAN AGRICULTURAL EXPORTS, DECEMBER, 1937.

PRODUCT.	Net Exports in Tons			
	Year 1936	Year 1937	December, 1936	December, 1937
Arecanuts ...	26,548	30,083	1,602	3,078
Coconuts fresh † ...	114,314†	95,223†	6,821†	8,569†
Coconut oil ...	46,507	39,764	3,352	3,660
Copra ...	76,681	75,593	7,099	9,647
Gambier, all kinds ...	2,188	1,965	176	76
Copra cake § ...	20,438§	14,901§	2,317§	734§
Palm kernels ...	4,964	7,312	290	495
Palm oil ...	29,296	42,788	2,650	3,236
Pineapples canned ...	76,403	80,504	5,503	5,103
Rubber ¶ ...	365,005¶	503,127¶	32,944¶	50,212¶
Sago,—flour ...	6,180	15,477	406	2,002
,, —pearl ...	3,319	3,760	272	253
,, —raw ...	7,484*	8,256*	616*	673*
Tapioca,—flake ...	1,535	1,058	119	51
,, —flour ...	2,418*	2,391*	462*	288*
,, —pearl ...	17,797	17,173	1,765	1,682
Tuba root ...	599	570	34	21

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
April ...	1,573.1	1,237.2	308.0	226.0
May ...	1,587.6	1,285.2	257.8	186.4
June ...	1,671.8	1,611.7	286.9	252.5
July ...	2,651.0	1,860.5	411.6	269.6
August ...	3,767.7	1,762.2	616.8	274.0
September ...	3,179.5	1,492.5	621.6	247.1
October ...	3,037.6	1,393.9	569.1	216.1
November ...	2,419.8	1,448.8	455.9	176.7
December ...	2,302.6	1,650.6	522.3	242.2
Total ...	27,733.5	17,932.8	5,094.7	2,811.4
Total 1936	23,081.2	8,812.3	3,791.0	1,340.7

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 31st December, 1937.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber not Tapped: Estates which have entirely ceased tapping: Acreage	Percentage of (5) to (2)	Estates which have partly ceased tapping (a): Acreage	Percentage of (7) to (2)	Area of Tappable Rubber never been tapped: Acreage	Percentage of (9) to (2)	Total area not tapped (5) + (7)	Percentage of (11) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Straits Settlements :—											
Province Wellesley ...	43,746	28,179	64.4	—	—	15,567	35.6	416	1.0	15,567	35.6
Malacca ...	122,875	86,347	70.3	753	0.6	35,775	29.1	2,363	1.9	36,528	29.7
Penang Island ...	2,512	1,486	59.2	258	10.2	768	30.6	45	1.8	1,026	40.8
Singapore Island ...	32,840	22,089	67.3	1,306	4.0	9,445	28.7	125	0.4	10,751	32.7
Total S.S. ...	201,973	138,101	68.4	2,317	1.1	61,555	30.5	2,949	1.5	63,872	31.6
Federated Malay States :—											
Perak ...	290,782	219,412	75.5	1,477	0.5	69,893	24.0	6,576	2.3	71,370	24.5
Selangor ...	331,244	259,018	78.2	1,440	0.4	70,786	21.4	7,278	2.2	72,226	21.8
Negri Sembilan ...	257,772	190,890	74.1	1,651	0.6	65,231	25.3	7,748	3.0	66,882	25.9
Pahang ...	85,296	64,123	75.2	2,274	2.7	18,899	22.1	8,357	9.8	21,173	24.8
Total F.M.S. ...	965,094	733,443	76.0	6,842	0.7	224,809	23.3	29,959	3.1	231,651	24.0
Unfederated Malay States :—											
Johore ...	473,865	361,261	76.2	3,397	0.7	109,207	23.1	32,097	6.8	112,604	23.8
Kedah ...	204,782	156,661	76.5	2,997	1.5	45,124	22.0	5,755	2.8	48,121	23.5
Kelantan ...	28,899	21,899	75.8	273	0.9	6,727	23.3	2,775	9.6	7,000	24.2
Trengganu (b) ...	4,817	3,172	65.9	—	—	1,645	34.1	100	2.1	1,645	34.1
Perlis ...	1,347	800	59.4	—	—	547	40.6	94	7.0	547	40.6
Brunei ...	5,285	3,686	69.7	1,105	20.9	494	9.4	709	13.4	1,599	30.3
Total U.M.S. ...	718,995	547,479	76.1	7,772	1.1	163,744	22.8	41,530	5.8	171,516	23.9
Total Malaya ...	1,886,062	1,419,023	75.2	16,931	0.9	450,108	23.9	74,438	3.9	467,039	24.8

Notes :—(a) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF DECEMBER, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealers	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: Jan. to Dec. 1937	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: Jan. to Dec 1937	Imports during the month: Foreign	Imports during the month: From Malay States & Labuan	Imports Jan. to Dec. 1937: Foreign	Imports Jan. to Dec. 1937: From Malay States & Labuan	Exports including re-exports, during the month: Foreign	Exports including re-exports, during the month: Local	Exports including re-exports, Jan to Dec. 1937: Foreign	Exports including re-exports, Jan to Dec. 1937: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over	Consumption 3: during the month	Consumption 3: Jan. to Dec. 1937
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,879	14,976	15,693	166.255	8,989	91,134	Nil	Nil	Nil	Nil	16,720	9,651	183,818	68,484	...	9,717	13,430	19	190
Johore ...	...	2,673	5,231	6,737	71,833	5,942	51,575	Nil	29	Nil	2,407	3,894	7,084	41,882	81,165	...	4,795	4,839	...	...
Kedah ...	...	516	3,888	4.077	41,174	1,624	15,622	Nil	Nil	Nil	Nil	2,710	3,266	26,198	30,387	...	586	3,543	...	...
Perlis ...	...	16	15	20	189	38	310	Nil	Nil	Nil	Nil	Nil	64	Nil	496	...	6	19	...	...
Kelantan ...	...	561	332	249	4,343	1,371	10,260	Nil	Nil	Nil	Nil	285	1,142	3,801	10,200	...	884	202	...	...
Trengganu ...	...	55	50	259	3,561	130	1,782	Nil	Nil	Nil	Nil	Nil	389	Nil	5,343	...	55	50	...	...
Brunei ...	...	31	70	62	743	124	1,056	...	...	...	...	...	212	...	1,770	...	Nil	75	...	...
Total Malay States	...	13,731	24,562	27,097	288,098	18,218	171,739	Nil	29	Nil	2,407	23,609	21,808	255,699	197,845	...	16,043	22,158	19	190
S. SETTLEMENTS :—																				
Malacca ...	...	2,171	1,272	1,618	17,313	1,197	9,786	Nil		Nil		3,766		38,229		...	2,217	1,311	...	...
Province Wellesley	...	2,976	828	625	6,733	562	3,707	Nil		Nil		8,113		101,777		...	2,943	809	...	...
Penang ...	1,868	5,137	23	23	242	280	1,616	2,612	19,211	34,523	192,283		Nil		Nil	4,299	5,842	8	...	...
Singapore ...	5,791	26,007	244	212	2,272	342	1,374	11,263		178,232		21,305		285,933		7,911	26,762	202	31	386
Labuan ...	...	47	Nil	Nil	Nil	38	247	74		691		Nil		Nil		...	43	Nil	...	...
Total Straits Settlements ...	7,659	36,338	2,367	2,478	26,560	2,419	16,730	13,949	19,211	213,446	192,283	33,182	Nil	425.939	Nil	12,210	37,807	2,330	31	386
Total Malaya ...	7,659	50,069	26,929	29,575	314,658	20,637	188,469	13,949	19,240	213.446	194.690	56,791	21,808	681.638	197.845	12,210	53,850	24,488	50	576

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	8,801	25.594	5.571	4.875	4.075	211
WET RUBBER	916	1.068	271	328	720	375
TOTAL ...	9.717	26.762	5.842	5.203	4.795	586

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan to Dec. 1937
29	30	31
Singapore ...	36.847	457.240
Penang ...	13.074	156.613
Port Swettenham.	6.514	64.886
Malacca ...	356	2.899
MALAYA ...	56.791	681.638

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Dec. 1937
32	33	34
Malay States ...	45.271	†450.627
Straits Settlements	4.187	†42.127
MALAYA ...	49.458	492.754

† Amended.

Notes :—
1. Stocks on estates of less than 100 acres and stocks in transit on rail. road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i. e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] — [2]— [3]—[4]—[5]—[9]—[10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 22nd January, 1938

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1937.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	88.2	72.0	80.1	93	69	80	74	82.7	83.9	8 08	205.2	2.01	22	16	2		7	134.20	4.33	36
Bukit Jeram, Selangor ...	86.3	72.1	79.2	90	70	81	74	82.7	85.2	6.96	176.8	1.86	17	13		3	2	168.30	5.43	45
Sitiawan, Perak ...	86.9	72 5	79.7	91	70	77	75	82.8	84.0	11.32	287.5	2.19	18	16	2	1		148.85	4.80	41
Temerloh, Pahang ...	84.9	72.0	78 5	90	70	76	73	83.3	85 3	5.17	131.3	0 74	22	17		4		114.00	3.68	31
Kuala Lipis, Pahang ...	84.2	71.0	77.6	91	69	75	73	81.5	83.4	11.13	282.7	2.23	26	21	1	8		103.80	3.35	28
Kuala Pahang, Pahang ...	82.0	73 4	77 7	85	71	75	75	80.2	83.3	30.97	786.6	5.44	21	20				112.60	3.63	31
Kallang Aerodrome, S'pore ...	85.3	74.2	79.7	89	71	78	76	80.8	82.5	10 31	261.9	1.87	24	21	7			120.45	3.89	32
Bayan Lepas Aerodrome Penang ...	86.2	73.5	79.9	91	71	77	75	82 3	83.5	1 51	38 4	0 35	14	7	1			155 60	5.02	42
Bukit China, Malacca ...	84.8	73.0	78 9	88	71	79	75	80 7	82.8	11.19	284.2	2.49	19	14	3		1	147.35	4 75	39
Kluang, Johore ...	85.7	71.2	78 5	91	68	74	73	80.4	81.9	11 46	291.1	2.07	21	19	3	6		122.30	3.95	32
Bukit Lalang, Mersing, Johore	81.8	72.3	77.1	85	70	74	76	79.7	80.7	29.13	739.9	5.01	25	19				137 85	4.45	37
Alor Star, Kedah ...	86.0	72.1	79 1	90	70	75	74	82 1	84.3	5.45	138 4	1.56	18	16	1			145.10	4.68	39
Kota Bahru, Kelantan ...	81.8	71.9	76 9	87	69	74	75	79.3	83 0	45.35	1151.9	8.35	22	20		3		105.75	3.41	29
HILL STATIONS.	81.2	72.0	76.6	85	70	75	74	78 7	81.2	57 61	1463.3	9.28	23	22			3	97.40	3.14	26
Fraser's Hill, Pahang 4268 ft.	68.9	61.3	65 1	74	58	62	63	69 9	71.1	9.93	252.2	2.47	29	24	4	23		75.10	2.42	20
Kuala Trengganu, Trengganu																				
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	70.3	57.5	63 9	74	52	67	61	69.3	69.7	7.37	187.2	1.55	27	20		2	1	82.70	2.67	23
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.1	58.8	64.9	75	56	65	61			6.85	174.0	1.53	26	19		1	1	83.95	2.71	23

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

MARCH, 1938.

EDITORIAL.

Breeding and Feeding of Pigs. The pig-breeding policy adopted at the Government Stock Farm at Serdang has been directed to the maintenance of a stock of English Middle White and Large Black breeds for the supply of stud animals to cross with the local Chinese pigs. At an early stage of the investigations it was observed that Chinese sows crossed with boars of either of these two breeds result in a progeny greatly superior to the Chinese sows. The litters have all the characteristics of the sire; in particular, the hollow back and flat pasterns of the sow are replaced by the straight back and well-developed pasterns of the boar. These improved characters result in an increase in the percentage of carcase to live-weight and an increase in the proportion of the more valuable parts of the carcase.

Chinese pig-breeders were not slow to appreciate the advantage of these cross-breeds as is shewn by the fact that over 200 stud animals have been distributed from the small Serdang stock during the past five years in addition to sale of stud animals from the smaller Agricultural Stations.

While the Chinese methods of pig feeding satisfied the owners by producing a marketable animal at from 8 to 10 months old, such methods were inadequate to satisfy the appetites of the cross-breeds as they reached maturity at an earlier date than the Chinese pig. Investigations have therefore been directed to a consideration of the concentrated rations suitable for cross-bred pigs, the economics of the question being kept in mind. The results of this investigation form the basis of an article by Messrs. T. D. Marsh and N. Kanagaratnam which is published in this number. Two alternative rations, consisting of foodstuffs easily procurable in Malaya, are given which have been found suitable and economical and which will rear the cross-bred pigs to one picul (133 lbs.) weight in 5½ to 6 months.

The more general adoption of improved breeds of pigs coupled with improved feeding is highly desirable and would go far towards making Malaya self-supporting in her requirements of pigs. There are over 700,000 pigs in Malaya, and the annual import of swine to supplement local production is about 150,000. The value of imports usually exceeds 2 million dollars, a sum that we expect to see gradually reduced as breeders improve their stock and their methods of feeding.

Composting. The problem of obtaining a satisfactory organic manure for market gardens and for horticultural purposes has engaged the attention of the Department of Agriculture for some years. Owing to the unimportance of dairy husbandry in Malaya, it is generally difficult to obtain adequate supplies of cattle manure for use in agriculture. Artificial manures are not a complete substitute for organic manures, for the latter stimulate soil bacteria and also improve the physical properties of the soil.

Early investigations on this subject were coupled with the desirability of discovering an economic method of disposal of the large quantities of waste from pineapple factories. In the article on Organic Composts which will be found in this number Mr. J. H. Dennett shews that he has not lost sight of this particular aspect of the question.

The major part of the article, however, is concerned with the adaptation to local conditions of a method of preparation of an organic manure similar to that which has proved successful in India. A marked measure of success has been obtained and to those whose interest centres in horticulure as well as to market gardeners is offered a means of obtaining adequate supplies of organic manure throughout the year.

Further investigations are in hand on this subject. Comparisons are to be made of making the compost in the open and under cover and with and without the addition of cattle manure and artificials. These further experiments will concern the economics of compost production; they are unlikely to affect the recommendations contained in the present article, but will supplement the information and possibly widen the practical application of this method of obtaining an effective substitute for cattle manure.

Original Articles.

PIG HUSBANDRY AND PRELIMINARY FEEDING TRIALS AT THE STOCK FARM, SERDANG

BY

T. D. MARSH,
Agriculturist,
and
N. KANAGARATNAM,
Stock Farm Assistant.

Introductory.

Pig husbandry has been practised at the Government Stock Farm, Serdang, for some years. The policy until recently was the establishment and maintenance of small herds of the English Middle White and Large Black breeds for the supply of stud animals for crossing with the local Chinese pigs.

Trials were made at Serdang in crossing boars of these breeds with sows of two types of Chinese pigs purchased locally. It was considered that cross-breeding experiments should be carried out at Serdang to obtain first-hand observations on the results and to supply a small demand for selected half-bred boars. It was appreciated that the Chinese breed had in the past been used fairly extensively in the establishment of many of the Western breeds, so that such cross-breeding is the mating of pigs not distantly related.

These cross-breeding trials, using the common piebald and black Chinese breeds, were in every way a success, whilst the prolificacy and good milking qualities of the Chinese breed were imparted to the offspring. The early maturing qualities of the English breed, their docility and better conformation were transmitted, so that cross-breds had a straighter back and more upright pasterns, with a larger percentage of the weight in the hind-quarters where the carcase is most valuable. In addition, the head was smaller and the percentage of carcase to live-weight higher.

The Chinese breeders were not slow to realize that it was to their advantage to cross-breed, and as soon as it was known that English breed stud pigs were available, the demand for boars and sows became steady and continuous. A total of 226 stud animals has been distributed from Serdang Stock Farm during the years 1932-1937, which has resulted in a regular increase in the percentage of cross-bred animals produced and observed to pass through the Kuala Lumpur abattoirs during each succeeding year and, to a lesser extent, through other abattoirs.

The work at Serdang has been extended to several Departmental Agricultural Stations, where small piggeries have been maintained for demonstration purposes and for the distribution of stud stock at reasonable prices to local pig-breeders.

The Department of Agriculture does not claim the whole of the credit for the improvement during recent years in the type of pig being produced in Malaya. Several European breeders have maintained piggeries and have distributed a number of animals carrying the strains of European breeds in varying proportions, and by their example of the crossing of boars of English breeds with Chinese sows they have been regular propagandists of Departmental policy.

The practice at Serdang has been to distribute only selected animals for stud purposes, the remainder being fattened for the local market. It is known, however, that sows have been selected by Chinese breeders from consignments sold for slaughter and retained for breeding purposes.

Rations have been based on research work carried out in temperate climates, and the knowledge of feeding can only be described as empirical when applied in the tropics; the live-weight increases correlated with time have compared unfavourably with the averages of temperate climates.

It is thought that the hot tropical climate causes a faster rate of respiration than is normal with these breeds in temperate climates and also reduces the appetite.

As the ordinary pig foods of temperate climates, such as barley meal, middlings and dairy by-products on which research in pig-feeding has been based are not available, rations must of necessity be composed of tropical concentrates. Although the rations have been calculated to the recognized feeding standards, no comparative results on actual feeding trials are available on which to base the feeding of pigs.

It is appreciated that the quality of the particular proteins and amino acids in foods plays a fundamental part in their suitability or otherwise for the particular class of feeding for which they are used.

Observations by the Veterinary Department at the Kuala Lumpur abattoirs indicate that tropical internal parasites show a far higher incidence of infestation in pure-bred European pigs and the cross-bred European—Chinese types than occurs in pure-bred Chinese pigs. Pure Chinese pigs are usually maintained on slatted floors on which reinfestation by the parasites is probably less liable to occur than when pigs are kept on concrete floors and in limited open yards, as usually practised by the larger progressive breeder, Chinese or European.

Loss of vigour, and consequently reduced growth-rate, may result from the breeding of temperate climate pigs in the tropics for several generations, and the periodic introduction of new blood at Serdang has been insufficient to maintain vitality.

Weaner pigs of pure European breeds at the age of 10 weeks average only about 25 lbs. in weight against an average figure in Europe of 30 to 35 lbs. Owing to the absence of dairy by-products, weaners are kept on the sows until they are 10 weeks old to give them a better start in life.

The milking capabilities of the sows have undoubtedly a fundamental influence on the weight of weaner-pigs and it is likely that the tropical climate depresses the milking qualities of sows of European breeds. On the other hand, the imported pigs at Serdang may be from strains which are not particularly good milkers.

This characteristic is most important when selecting gilts for breeding purposes and it is the usual custom amongst pig-breeders to cull from their herds any young sows that cannot feed their first litter *ad libitum*. This principle has been adopted at Serdang with the Large Black breed, but it has been difficult to apply to the Middle White breed owing to losses and the small number of animals in the herd.

When it is appreciated that a well-suckled litter may be 200 to 300 lbs. live-weight and possibly heavier than the mother at 8 to 9 weeks of age, and that 75 per cent. of this live-weight gain is derived from the mother's milk, it will be realized that sows must be remarkably heavy milkers.

The young pigs between the ages of 10 and 20 weeks have been observed to make poor increases in weight. It appears that at this period they are unable to make full use of the proteins usually supplied in their rations and the lack of dairy by-products is most noticeable.

It is a question whether the minerals supplied in milk have not also a fundamental bearing on their well-being and that added raw materials will not adequately replace those obtained from food-stuffs.

Until recent years the Chinese method of feeding pigs was to use those foods that were the cheapest to buy. Early maturity was of little importance, and provided the animals attained weights suitable for slaughtering for the local market at 8 to 10 months of age the owners were satisfied. The cross-breeding that has taken place during recent years has produced animals that require more concentrated rations, and to satisfy their appetite the use of soya bean cake in the rations has been extended. Furthermore, the pure English and cross-bred brood sows have been observed to be, in general, poorer milkers than the pure-bred Chinese sows, and the feeding of soya bean cake to the sows and in the form of a gruel to the litters has become almost universal. This more intense feeding has resulted in earlier maturity and although the rations are more expensive they are fed for a shorter time.

Feeding Trials at Serdang.

An opportunity occurred early in 1937 to commence preliminary trials of feeding weaner pigs. Two Middle White sows farrowed on the 16th and 17th January. Three pens of four pigs in each pen were used for trials; pens of this size are too small for a statistical analysis of the results, but it was thought that the trials might give some indication of the suitability or otherwise of certain foods for the supply of proteins.

The rations were balanced as near as was practicable to Kellner's Standards using the same ingredients, except those forming the principal supply of protein.

Endeavours in the past have been made to purchase dried separated-milk or dried buttermilk, but the prices have always appeared to be too high. Furthermore permits to purchase separated-milk powder are necessary under the Foods Enactment.

Whey powder became available early this year and, whilst not strictly a protein food, it is a dairy by-product containing albulactin, lactose, and milk minerals and its price was fairly reasonable.

The three rations used for the first 10 weeks of the trials were made up as follows:—

Ration A 1. Standard.
Constituent Under Test—Soya Bean Cake.

Food.	Quantity	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Broken rice ...	26	1.66	.08	20.77	23.03
Rice polishings ...	3	.21	.34	1.22	2.70
Coconut cake (double-pressed) ...	5	.64	.43	2.34	4.41
Soya bean cake ...	11	4.01	.40	2.58	9.22
Guinea grass ...	10	.09	—	.79	2.50
Banana stems ...	20	.02	.02	.07	1.02
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	0.5	—	—	—	.50
TOTALS ...	76.5	6.63	2.27	27.77	44.38

Ration B 1
Constituents Under Test – Whey Powder and Soya Bean Cake.

Food.	Quantity	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Broken rice ...	16	1.02	.05	12.78	14.18
Rice polishings ...	4	.28	.46	1.63	3.60
Coconut cake (double-pressed) ...	6	.77	.51	2.81	5.29
Soya bean cake ...	8	2.92	.29	1.88	6.70
Guinea grass ...	10	.09	—	.79	2.50
Banana stems ...	20	.02	.02	.07	1.02
Palm oil ...	1	—	1.0	—	1.00
Minerals ...	.25	—	—	—	.25
Whey powder ...	10.00	1.40	.05	7.30	9.80
TOTALS ...	75.25	6.50	2.38	27.26	44.34

Ration C 1
Constituent Under Test—Whale Meat Meal.

Food.	Quantity	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Broken rice ...	30	1.92	.09	23.97	26.58
Rice polishings ...	2	.14	.23	.81	1.80
Coconut cake (double-pressed) ...	2	.26	.17	.94	1.77
Soya bean cake ...	2	.73	.07	.47	1.68
Guinea grass ...	10	.09	—	.79	2.50
Banana stems ...	20	.02	.02	.07	1.02
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	.25	—	—	—	.25
Whale meat meal ...	8.00	3.87	.80	—	7.50
Totals ...	75.25	7.03	2.38	27.05	44.10

The foregoing rations were made up to Kellner's Feeding Standards for animals averaging 44 lbs. live-weight, which require the following amounts of constituents daily for every 1,000 lbs. live-weight:—

	lbs.
Dry matter	44
Digestible crude protein	6.6
Fat	1
Nitrogen-free extract	28

The rations were constituted to test the effect of one dominant ingredient on live-weight increase. Other foods in the rations were similar, but the proportions were varied so that the rations could be balanced.

Ration A 1 was regarded as standard and the dominant ingredient was soya bean cake.

Ration B 1 supplies a reduced amount of the soya bean cake plus whey powder, which is a dairy by-product containing the important milk minerals and an easily digested food.

Ration C 1 was included to test the value of whale meal as a source of protein; a little soya bean cake was used to balance the ration to Kellner's Standards.

To rations B 1 and C 1 4 ozs., and to ration A 1 8 ozs., of a mineral mixture were added per 1,000 lbs. live-weight of pigs and made up of two parts sterilized steam bone flour, two parts air-slaked lime and one part common salt.

The added minerals were varied in amount, since whale meal contains a fairly high percentage of calcium phosphate and whey powder is rich in reputed easily assimilated minerals.

To all rations 1 lb. of red palm oil per 1,000 lbs. live-weight of pigs was added per day to ensure that adequate amounts of vitamin A were present. The oil content of the rations, however, was in excess of standard requirements for the production of carcases for curing into bacon and ham and such an excess would probably have an adverse influence on the quality of the flesh, but it matters little for the fresh pork trade in this country.

All pigs were dosed with santonin, calomel, and epsom salts before the feeding trials were commenced in an endeavour to expel worms from the alimentary canal.

The pigs were divided into lots of four comprising two boars and two sows and they were selected as near as possible to the same average weights in each of the three pens. The foods were mixed with water in the proportion of three parts of water to one part of meal, and the latter was soaked for twelve hours before feeding. The animals had access to water at all times.

The results of the first trials with Middle White Pigs were as follows:—

	A1 Ration Soya Bean	Ration B1 Soya Bean and Whey Powder	Ration C1 Whale Meat Meal
	lbs.	lbs.	lbs.
Initial average weight at 9 weeks ...	23.25	23.50	23.50
Average weight at 13 weeks. ...	36.25	36.75	32.00
" " 17 " ...	70.37	69.75	55.25
" " 19 " ...	85.75	82.00	64.00
Live-weight gain, total in ten weeks ...	62.50	59.50	40.50
Live-weight gain per day ...	0.89	0.85	0.58
* Meal consumed per 1 lb. live-weight gain Dry ...	2.06	2.50	3.41
Wet ...	3.01	3.68	5.01
Cost of ration per lb. ...	2.82 cts.	4.61 cts.	3.64 cts.
Cost of food per 1 lb. live-weight gain ...	5.80 cts.	11.52 cts.	12.41 cts.
Value of gain per day at current market price, say $20 per picul or 15 cents per lb.	13.35 cts.	12.75 cts.	8.70 cts.

* The actual weights of concentrates were used in the calculation, but weights of both wet and dry succulent foods are taken into account in the above table.

These trials indicate that there is no advantage to be obtained in adding whey powder to a balanced ration containing a fair proportion of soya bean cake with sufficient simple minerals.

Whale meat meal does not provide a protein as suitable for young pigs as that derived from soya bean cake.

The live-weight gain was achieved in the A and B rations with a smaller amount of concentrates than is usual in colder climates, which may suggest that a smaller amount of food is used for the maintenance in the tropics of the bodily temperature, and/or the pigs were able to digest the excess oil fed. Since the animals were satisfied with light rations it would appear, however, that the hot climate impairs their appetite.

These inferences suggest that possibly a slightly higher percentage of protein to nitrogen-free extract and fat may produce better live-weight increases without impairing digestibility of the ration.

Ration A 1 is apparently far more economical than B 1 and C 1 since it is cheaper per lb. and requires a smaller quantity to produce each unit of live-weight increase.

Broken rice, while being an excellent ingredient in the ration of weaner pigs, is considered to be expensive for fatteners, and at four months old, or possibly earlier, it is necessary for economical reasons to replace it with tapioca tubers, sweet potato vines or tubers, or other carbohydrate foods.

When the pigs under test were 19 weeks old the broken rice, banana stems, and Guinea grass were replaced by cooked fresh tapioca tubers, and, utilizing the same ingredients as formerly to make up the rations, they were balanced to suit pigs of 88 lbs. live-weight, which according to Kellner's Standards are as follows:—

	lbs.
Dry matter	36
Digestible crude protein	5
Fat	0.8
Nitrogen-free extract	23

Ration C 2

Constituent Under Test—Whale Meat Meal.

Food.	Quantity.	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Tapioca roots ...	60	.60	—	18.48	21.00
Rice polishings ...	2	.14	.23	.81	1.80
Coconut cake (double-pressed) ...	3	.39	.26	1.42	2.36
Whale meat meal ...	8	3.87	.80	—	7.50
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	.25	—	—	—	.25
Totals ...	74.25	5.00	2.29	20.71	33.91

The results of the second feeding trials were as follows:—

	A2	B2	C2
	lbs.	lbs.	lbs.
Average live-weight on 12th June ...	90.87	93.50	63.00
" " 26th " ...	107.37	105.50	61.00
" " 30th " ...	118.50	112.62	64.62
Live-weight gain 1st to 30th June ...	32.75	30.62	0.62
Live-weight gain per day ...	1.09	1.02	0.02
* Meal consumed per lb. live-weight gain (dry basis tapioca) ...	4.09	3.88	207.66
Cost of ration per lb. ...	2.11 cts.	3.01 cts.	3.15 cts.
Cost of food per 1 lb. live-weight gain ...	8.63 cts.	11.68 cts.	$ 6.54
Value of gain per day at current market price, say $20 per picul or 15 cts. per lb	16.36 cts.	12.01 cts.	0.03 cts.

* The actual weights of concentrates were used in the calculations, but dry weight of tapioca tubers only was used.

The trials were carried on for a further four weeks when the pigs were fed on the following rations:—

Ration A 2
Constituent Under Test—Soya Bean Cake.

Food.	Quantity.	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Tapioca roots ...	50	.50	—	15.40	17.50
Rice polishings ...	6	.42	.68	2.44	5.40
Coconut cake (double-pressed) ...	6	.77	.51	2.84	5.29
Soya bean cake ...	9	3.29	.32	2.11	7.54
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	.50	—	—	—	.50
TOTALS ...	72.50	4.98	2.51	22.79	37.23

Ration B 2
Constituents Under Test—Whey Powder and Soya Bean Cake.

Food.	Quantity.	Digestible Protein.	Fat.	N-free Extract.	Dry Matter.
	lbs.	lbs.	lbs.	lbs.	lbs.
Tapioca roots ...	40	.40	—	12.32	14.00
Rice polishings ...	6	.42	.68	2.44	5.40
Coconut cake (double-pressed) ...	6	.77	.51	2.84	5.29
Soya bean cake ...	7	2.56	.25	1.85	5.86
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	.50	—	—	—	.50
Whey powder ...	5.	.70	.02	3.65	4.90
TOTALS ...	65.50	4.85	2.46	23.10	36.95

Comments.

Ration A 2, which is the cheapest, gives the greatest and most economical live-weight increases.

No advantage is gained by the addition of whey powder to soya bean cake; the whey powder successfully replaces the soya bean cake but at an enhanced cost. If the smallest pig is excluded from lots A and B the results are very similar, but the soya bean cake fed pigs show a very slight advantage in live-weight gain.

The whale meal is not only incomparable with soya bean cake, but apparently quite unsuitable as the main source of protein in rations for young pigs. It would seem that the ration must be deficient in some important ingredient which is possibly protein or amino acids, and these results are more pronounced when whale meat meal is fed in conjunction with cooked tapioca tubers than when fed with soaked broken rice.

Greater live-weight increases would probably have been obtained if the boars had been castrated.

It is interesting to record that after the boars and sows had been segregated at the conclusion of the trials and all the animals were put on to ration A 2 the pigs that had previously been fed on whale meal each gained an average of 1.10 lbs. per day during the next 14 days compared with a live-weight gain of .02 lbs. per day during the previous month. (see Appendix A).

Summary.

These feeding trials indicate that rations A 1 or A 2, *i.e.* either made up with broken rice for young pigs or tapioca for older animals, although apparently

expensive, are economical and will rear Middle White pigs to a picul (133 1/3 lbs.) weight in 5½ to 6 months.

These trials emphasise forcibly that calculated balanced rations are not necessarily suitable for feeding a particular class of livestock and the only method of proving the value of rations is by feeding trials.

Appendix A.

Records of Individual Weights of Pigs.

Date of farrowing 17th January, 1937.
Date of weaning 21st March, 1937.

	Rice Rations				Tapioca Rations		
	21st March	18th April	16th May	30th May	12th June	26th June	30th June
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Ration A.							
No. 74 gilt ...	25	36	66½	82	89½	97½	110
No. 46 „ ...	27	41	81½	102	114½	127½	142
No. 67 boar ...	22	37	72	87	76	111½	120
No. 93 „ ...	19	31	61½	72	83½	93	102
Ration B.							
No. 72 gilt ...	25	38	69½	78	91½	102½	109
No. 82 „ ...	19	27	48½	60	68½	75½	84½
No. 77 boar ...	30	48	89½	103	116½	130½	135
No. 66 „ ...	20	34	69½	87	97½	113½	122
Ration C.							
No. 63 gilt ...	23	30	52½	64	59½	56½	58½
No. 69 „ ...	22	29	49½	55	56½	56½	59
No. 70 boar ...	24	32	53½	64	63½	61½	67
No. 64 „ ...	25	37	65½	73	72½	69½	74

Animals fed on Ration A from 1st to 15th July 1937; weights on the latter date were as follows:—

No. 63—72½ lbs. No. 69—78 lbs., No. 70—77½ lbs. No. 64—92 lbs.

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ORGANIC COMPOSTS

BY

J. H. DENNETT,

Senior Chemist (Soils).

Until recent years Malaya has been regarded as a land of great fertility where manures were never required save to produce flowers in the garden. Permanent crop agriculture being almost universal on inland soils, this belief and general attitude is not altogether surprising when it is remembered that land was for the most part opened up from jungle, where conditions of shade and moisture had allowed an accumulation of plant nutrients.

Nowadays, it is the practice rather than the exception to apply fertilizers, in such specific form as may suit, to permanent, as well as to annual crops.(1) The vast majority of fertilizers so applied are in the form of naturally-occurring or artificially prepared mineral material.

Although these artificial fertilizers may have a considerable stimulatory effect on growth or production, there frequently comes a point where such increase cannot be maintained by further applications. As a sequence, consideration has been given to the use of cattle manure, the perennial effect of which, as a fertilizer, has been known since man began to till the soil.

The beneficial effect of cattle manure is due both to its mineral nutrient content directly comparable to artificial fertilizers and to its organic content, the function of which is to stimulate soil bacteria. The obstacle to its use in Malaya is one of supply, owing to the negligible amount of dairy farming or cattle keeping.

In an attempt to find substitutes for cattle manure, enquiries are received from time to time as to the methods of preparation of organic compost. These enquiries are usually concerned with the production of composts for horticultural purposes.

The preparation of composts has been carried out on a large scale for some years at the Institute of Plant Industry, Indore, India, and is now well-known as the Indore Process. Details of the methods and the results obtained were published in 1931 by Howard & Wad under the title of "The Waste Products of Agriculture."(2)*

A number of minor experiments on these lines were carried out locally by Greenstreet (4) and Wilshaw (5) and subsequently published.

A fresh series of experiments was carried out in the laboratory, in which the compost materials, consisting of plant residues readily obtainable locally, were contained in boxes with sloping sides 24 in. x 30 in. at the top, by 20 in. deep. In subsequent experiments the scale was increased by utilizing covered concrete tanks. It was found, however, that these tanks were too shallow and had too great a cooling area.

* This book was reviewed in the *Malayan Agricultural Journal* in 1932. (3)

In view of the frequent and heavy rainfall experienced in Malaya it was considered that to follow the Indore method of open pits would be unsatisfactory and would lead to mosquito breeding, anaerobic conditions and possibly to pest of flies. All work on a large scale, therefore, was conducted with heaps in the open. These heaps were situated within a hundred yards of houses and no complaints were received in regard to flies nor were any flies observed round the heaps throughout the period of preparation.

Raw Materials.

In a country growing chiefly annual crops there is always a large amount of waste material at hand, but in Malaya where the main dry land crops are rubber, coconuts and oil palm, waste is a somewhat difficult matter to obtain in quantity. On oil palm estates there are bunch residues, but, in general, where permanent crops are grown it is necessary to collect the raw material such as green covers, secondary jungle growth or grass.

On or near small holdings, or in market gardens, an adequate supply of green material may be available, while in gardens surrounding houses or schools there is always sufficient grass to form the basis of a good compost heap with the addition of leaves and general plant remains.

There is, however, one industry of some importance to this country where the disposal of waste is a major problem. In the pineapple factories waste was at one time piled in heaps in the hope of its rotting down, and Greenstreet (6) carried out experiments in this connexion with the object of turning these heaps into a compost. He came to the conclusion that owing to the heaps containing 95 per cent. of moisture, a satisfactory product could not be obtained without a preliminary pressing. Latterly, it has been the practice to dump the refuse into the nearest river, but even this is becoming a nuisance and the question of its proper disposal is not completely solved. Further experiments were therefore carried out on the lines of the Indore Process and, as will be shewn, it was found that a satisfactory compost could be obtained in good weather by dealing directly with the wet waste. Unpressed waste will break down to a satisfactory compost and the advantage of pressing is to reduce the bulk of material to be handled.

The Process.

The first outdoor experiments were carried out with mixed grass and leaves in heaps about 8 ft. x 6 ft. by 3 or 3½ ft. deep.* The raw materials were thoroughly withered in the sun to remove practically all internal moisture, as otherwise the material tends to ferment internally (within the cells) rather than break down externally (in the epidermis). About 500 lbs. of dried material were used per heap.

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* Any greater depth tends to compress the lower portions and prevent proper aeration when rainfall is heavy.

Following the Indore Process the leaves and grass were wetted with water and thoroughly mixed. The bottom layer was made by spreading this wetted material to a depth of about 4½ inches over an area of 48 square feet. A slurry was then made up of about 5 lbs. fresh cow-dung, ½ lb. wood ash and 3 gallons of water. This was thinly sprinkled over the layer. Small pieces of dung of about half a cubic inch were then scattered over the layer, followed by a sprinkling of cattle urine and a dusting with wood ash. Being unavailable, urinated earth, as recommended by Howard, was not added, neither was any additional earth used, as local soil has an acid pH value between 4.0 and 5.5 and could only react unfavourably on a process which must be kept rather on the alkaline side. Further series of layers were built in a similar manner until the heap was about 3 feet deep when it was covered with a layer of dried grass to protect it from rain.

A second heap was made in a similar manner but with the addition of 3 lbs. calcium cyanamide to see whether an improved product was obtained and whether there was a more rapid decomposition. Similarly 3 lbs. of sulphate of ammonia were added to a third heap, and 6 lbs. of lime to a fourth heap. A fifth heap was built in a somewhat different manner; all the ingredients, leaves, grass, dung, urine, wood ash and water were thoroughly mixed and then made into the heap.

All the heaps were turned on the fifteenth day and a further batch of similar heaps made in the same manner as the first except that they received an inoculation from the original heaps by the incorporation of 5 lbs. of material taken from the centre of the latter and mixed with the slurry.

At the next turn, fifteen days later, the second batch was again inoculated from the first batch, and a third batch was prepared and inoculated from the second batch.

At the end of forty-five days the heaps were again turned, a portion of the first batch being again used to inoculate the second, which was now at the thirty-day stage.

The last turn was made at the end of sixty-days *i.e.* four turns in all, after which the heaps were allowed to mature for another month, when they were considered to be ready for use.

A second series was started in which the 3 lbs. of nitrogenous fertilizers were replaced by phosphates, either 6 lbs. of superphosphate, 6 lbs. of rock phosphate or 6 lbs. of basic slag.

A third series was started in which the basic material consisted of one-third green manure and two-thirds dried grass. The heaps were treated with phosphates or lime in a similar manner to the second series.

It is to be noted that, with the exception of the first batch of the first series, every heap was inoculated at each turn from a heap a fortnight older.

A fourth series was prepared on a somewhat larger scale in which it was attempted to break down oil palm fronds and petioles. These heaps were made 12 ft. x 9 ft. x 3 ft. and consisted of grass and leaves as in the earlier series to which were added approximately 50 per cent. of their weight of petioles and about 20 per cent. of fronds.

The final series consisted of fresh pineapple waste with and without admixture of grass.

Composition of Heaps.

The series is tabulated below:—

Series I (three batches at 14 day intervals)		Series II (three batches at 14 day intervals)
Heap		
1.	Control.	Control.
2.	3 lbs. Calcium cyanamide.	6 lbs. Superphosphate.
3.	3 lbs. Ammonium sulphate.	6 lbs. Rock phosphate.
4.	6 lbs. Lime.	6 lbs. Basic slag.
5.	Materials previously mixed with slurry before making into layers.	6 lbs. Lime.
	Series III.	Series IV.
	As Series II, but Crotalaria and *Tephrosia candida* substituted for leaves.	As Series I control, but old oil palm fronds and petioles incorporated.
	(One batch only)	3000 lbs. grass and leaves.
		1800 lbs. oil palm petioles.
		600 lbs. oil palm fronds.
		Dung and ash in proportion.
Series V — Fresh Pineapple Waste.		
Heap		
1.	1300 lbs. waste, 3000 lbs. dried grass.	
2.	4100 lbs. waste, 1200 lbs. dried grass.	
3.	500 lbs. waste, 100 lbs. dried grass.	
4.	4700 lbs. waste only.	

Temperatures.

Some eight hours after the heaps are first made the temperature begins to rise and, by the end of two days the centre of a well-made heap should be about 125°F., rising by the following day to about 135°F. if the batch has not been inoculated from a previous heap, while if such inoculation has taken place the temperature should be about 10°F. higher. From the fourth day the temperature begins to fall, and by the time of the first turn the centre of the mass should have a temperature of about 100° to 105°F.

Provided there is no rain during the first fifteen days up to the first turn, a considerable amount of evaporation takes place and it is necessary to add water

when turning the heap and inoculating from a thirty-day heap. After this first re-making the temperature rises again during the next three days to about 130°F., gradually falling to between 100° and 105°F. by the end of thirty days. When the heap is again re-made and inoculated from a forty-five day old heap the temperature again rises, but only to about 115°F., and by the end of forty-five days has generally dropped to only a few degrees above atmospheric temperature. After the final turn and inoculation from a sixty-day old heap, there is practically no change in temperature. Although it has not completely lost its original form, the compost may be used at this stage, but the normal procedure, as stated previously, is to keep it for a further month until the material is in the form of a completely disintegrated mould.

Wet Weather.

Although Howard found in India that heaps made in monsoon weather did not differ fundamentally from heaps made in the dry season, locally it was found that heaps of the size described were considerably affected by rain, both as to the rate of decomposition and disintegration and as to the condition of the final product. Continuous rain lowers the temperature of the heaps considerably with a consequent slowing down of the initial stages of decomposition; in addition there is a tendency for the lower layer to become semi-anaerobic with an almost complete fall in temperature to normal. Analysis has shewn that the potash and phosphate contents, and, to a slight degree, the nitrogen content, were reduced by wet weather.

If the compost is to be used for horticultural purposes, the heaps made during the months October—November and March—April, might with advantage be protected by a leaf shelter.

Nitrogen and Phosphates.

The addition of nitrogen or phosphates appears to have little bearing on the rate of decomposition and no great effect on the mineral content of the final product. Lime, however, does appear to hasten the breaking down of the raw material, blackening taking place more rapidly and in addition, the heap, even at the first turn, appears to break up more readily. On the other hand, as is to be expected by the addition of lime, there is a reduction in the nitrogen content. The same effect of more rapid decomposition could probably be obtained by the use of larger quantity of wood ash and, although the nitrogen content would probably be lowered, the product would show an enrichment in phosphate and potash. Unfortunately, ash is not always available in sufficient amounts to enable a larger quantity than that indicated to be used. It is suggested that wood ash should be used as a standard; when unavailable it may be replaced by lime.

In the heaps made with chopped oil palm fronds and petioles it was found that while the fronds broke down fairly easily, even at the end of three months the petioles as a whole were undecomposed. The addition of green manure appeared to have very little effect on the nitrogen content of the final product.

The actual amounts of phosphates and potash present appear to vary according to the rainfall. The 1.2 per cent. of phosphate fertilizer added (varying from 0.2 to 0.4 per cent. of $P\ O_5$ according to type of fertilizer) does not appear to be reflected in the results.

It would appear better, if it is required to enrich the compost with any mineral fertilizer, to do so immediately before use rather than at the time of composting.

Dung and Urine.

While it is usually possible to obtain a certain quantity of fresh cattle dung for starting the heaps, cattle or horse urine is less easy to obtain.

The great advantage of the addition of urine is that a higher initial temperature is obtained with a consequent hastening of the early stages, but owing to the general difficulty of obtaining it in sufficient amounts for treating every fresh heap it is considered best to disregard it as a usual constituent of the compost heap in Malaya. It is, however, worth adding (when the price is reasonable) to an occasional fresh heap which is to be subsequently used to inoculate other heaps. Fresh dung must be regarded as essential as a rapid "starter" but the quantities used are so small as to have little effect on the final composition.

Laboratory Box Experiments.

In the first laboratory box experiments mentioned above, the layers were made in the box in the same way as in the field but it was found that while the temperature at the centre rose in a normal manner, the small cubic capacity of the boxes entailed a large cooling area, so that only a comparatively small amount of the materials reached the high temperature requisite for decomposition in the early stages. To obviate the difficulty each box was placed in a larger box (28 in. x 34 in. at the top, by 20 in. deep) and the space between the two was tightly packed with hay. This was found to give excellent insulation, and the temperature at the centre at the end of two days reached 160°F.

Although it cannot be recommended for any large-scale work the box method has certain advantages for the small garden, where there are no very large quantities or organic rubbish. It can be readily carried and can be put in a garage or outhouse in wet weather, while turning is easier as the contents of the box can be easily tipped and replaced.

Pineapple Waste.

The pineapple waste series followed much the same course as the others. Dried grass was added in the first heap as a means of absorbing part of the 95 per cent. moisture. Lime was added to neutralize the acidity of the juice rather than as a direct means of hastening decomposition, but in a process which needs a neutral or alkaline medium the neutralization of acid accelerates the rate of decomposition.

The pineapple waste alone, with added lime and slurry, at the end of two months appeared to be in a more advanced state of decomposition and disintegration than composts made of grass and leaves, so that it was considered that the experiment might be tried on a large scale in the field.

By the courtesy of the Malayan Pineapple Company, experiments were laid down at Batu Ampat Estate, Klang, using the pineapple waste from the Klang factory.

The heaps were made 18 ft. x 12 ft. x 4 ft. high and dried pineapple leaves were mixed with the fruit partially to absorb moisture.

About 20 tons of fruit waste were used daily for 23 days, using about 10 tons per heap until an area of approximately an acre was occupied by the heaps. In each heap about 24 lbs. of lime, 12 lbs. of ash, and 150 lbs. of dung were used. The heaps were covered with dried pineapple leaves partially to protect them from rain.

The site was not ideal as the land consisted of shallow consolidated peat overlying a heavy clay. Consequently the soil was of little use as an absorbent and there was a considerable tendency for the water which drained from the heap to lie on the ground, so that the lower portion of each heap was under anaerobic conditions. In addition, from the time the heaps were made to the end of the three months' period there were heavy rainstorms, which tended to prevent the temperature of the heaps from rising to an optimum. Further, the pineapple leaves added as absorbents shewed little tendency to break down under these weather conditions.

A trial heap made at Klang about a fortnight before the advent of the wet weather shewed normal decomposition in the initial stages, and although decomposition was retarded later it remained considerably more than a fortnight in advance of the heaps made at a later date.

On a large scale such as this, very little can be done to counteract the effect of wet weather. There is no doubt that owing to its original high moisture content normal decomposition of pineapple will be checked by wet weather much more than will a compost made of dried grass and leaves. The only course is to await the advent of drier weather and then open the heaps and expose them to the sun until the moisture content is normal for compost work.

In consequence of the wet weather the heaps were not really ready for use until more than four months had elapsed from the time they were first made and even after this period, the dried leaves, originally added as an absorbent, were not completely decomposed.

It would appear, therefore, that for dealing successfully with pineapple waste, adequate arrangements must be made for draining the land, and any material which distintegrates only with difficulty should be avoided as an absorbent. It is probable that distintegration of pineapple waste would be more rapid if the heap could be made on a platform raised about an inch or two off the ground or if a channel were dug round the heap.

The Value of Composts.

The actual value of the pineapple compost in terms of mineral fertilizer varies to some extent with the weather, but an average figure is given in the table below. This table indicates that 5 tons of finished compost, assuming all nutrients are readily available, is equivalent in manurial value to approximately 1 cwt. rock phosphate, 4 cwt. sulphate of ammonia, and ½ cwt. sulphate of potassium.

It is maintained by Howard (1) and Jones,(7) amongst others, that the main object of composting is to alter the carbon/nitrogen ratio from 40/1 or 50/1 down to 10/1, a ratio which they consider in general fairly constantly retained on inland soils. The view is held that if the carbon/nitrogen ratio is not reduced to this amount, the stimulus of soil bacteria due to the excess of carbon tends to the temporary locking up of nitrogen. While this may be true for tropical climates with well-defined wet and dry seasons, it is doubtful whether it applies equally to lands of the equatorial rain belt, where there are no sharply defined seasons. In Malaya, the disappearance from the soil of added organic matter takes place with almost incredible rapidity.

Composting certainly makes for a lowering of the carbon/nitrogen ratio. Local preparations of compost have never resulted in the carbon/nitrogen ratio falling below 20/1. Examination of the composts from Cameron Highlands, Perak and Kuala Lumpur shows that the ratio in general of the finished product varies between 20/1 and 25/1 as against 15.5/1 obtained in monsoon weather at Indore.

It is not improbable that local climatic conditions have some bearing on this result. In spite of this high ratio the finished product is actually considerably richer in nitrogen than that obtained in India. This carbon/nitrogen ratio can be adjusted readily immediately before use by the addition of about 1½ lbs. of sulphate of ammonia per 100 lbs. of compost.

It should be noted that the mineral content of locally prepared compost is very much lower than that of locally prepared cattle manure, especially in regard to the phosphate content.

A further and most important point in composting is the breaking down of the pentosans, which may be regarded as organic matter not readily attackable by soil bacteria. If the composting process has followed a normal course the pentosan content should be reduced to about 5 per cent. of the dry weight. In the writer's opinion, this breaking down of pentosans is more important than the question of the final carbon/nitrogen ratio.

The table below shows the analysis of typical finished composts:—

Percentage Composition of Compost made from Leaves and Grass and Pineapple Waste (on dry basis.)

Carbon	Nitrogen	C/N Ratio	Pento-sans	Lime Ca O	Phos phates P_2O_5	Potash K_2O	Magne-sia MgO	Loss on ignition	Moisture
Leaves and Grass Compost									
35	1.75	21.6	5.1	0.60	0 60	0.55	0.20	51	57
Ordinary Cattle Manure made in open at Serdang.									
—	—	—	5.8	—	1.27	1.18	—	43	50
Bengali Cattle Manure									
—	—	—	11.24	—	1.0	1.09	—	57	66
Pineapple Waste Compost									
35	1.6	22	5.0	1.4	0.43	0.41	0.04	80	67

References.

(1) Dennett, J. H. Suggested at a lecture to the Incorporated Society of Planters in 1924.

(2) Howard & Wad. The Waste Product of Agriculture, published by Melford.

(3) *Malayan Agricultural Journal,* Vol. XX, 1932, page 423.

(4) Greenstreet, V. R. *Malayan Agricultural Journal,* Vol. XVI, 1928, pages 194—203.

(5) Wilshaw, R. G. H. *Malayan Agricultural Journal,* Vol. XIX, 1931, page 593.

(6) Greenstreet, V. R. *Ibid.* and *Malayan Agricultural Journal,* Vol. XVI, 1928, page 8.

(7) Jones, K. B. W. *Planters Chronicle,* Vol. XXXII, No. 6, page 149.

(8) Composting. Agricultural Leaflet, No. 17. Department of Agriculture, S.S. and F.M.S. 1937.

ORYCTES RHINOCEROS L. AND OIL-PALMS.

A Warning.

Oryctes rhinoceros L. has previously been reported as boring the crowns of oil palms and, whilst this beetle is undoubtedly more prevalent on the coconut palm, it has become increasingly evident on oil palms on certain properties. The two sources in which its grubs have been comparatively recently discovered are decaying stumps and logs of the rubber tree and compost heaps. With the disappearance of the rubber material, *Oryctes rhinoceros* L. should not cause further anxiety but, if the making of compost heaps becomes a regular estate practice, Oryctes may, if care is not exercised, develop into a more important pest than hitherto to the oil palm.

Compost on one estate is composed of well-rotted pericarp, cattle manure and ash from burnt fruit bunches. These substances are placed in pits in separate layers and the whole, during a period of about one month, is turned over two or three times. On another property it consists of cattle manure and undecomposed fruit bunches, grass cuttings and similar material, and is stacked in heaps for some two months when, during that period, it is turned over about every two weeks. Cattle manure has been generally known for a long time as a favoured breeding ground for Oryctes, but decayed pericarp fibre and rotted fruit bunches are not so widely recognized. Observations have not been sufficiently extensive to state definitely the exact length of time when pericarp and fruit bunches become sufficiently rotted to attract Oryctes beetles for egg-laying but they suggest that the period is about six months, but under conditions favouring decomposition, this might be considerably less, from three to four months. In this connexion, it may be mentioned that the beetle appears to be attracted to partially burnt fruit bunches sooner than to unburnt similar material and that the grub of Oryctes has been found in the accumulations of palm bunch refuse in the vicinity of stripping sheds.

It should be remembered that whether fresh or decomposed material enters into the composition of compost, cattle manure is one of its constituents and may attract the beetle of Oryctes for egg-laying, but provided that from the commencement and during the course of the preparation of the heaps or stacks all grubs and/or beetles seen are collected and destroyed, the compost should not become a breeding ground for Oryctes.

Compost about 1 in. in thickness at the rate of from 6 to 7 tons per acre is generally placed between the rows of palms in trenches which are about 5 ft. wide and from 3 in. to 6 in. deep and covered with soil. It is considered that, if compost is so applied or if spread on the surface of the soil at the above-stated rate, the grub of Oryctes, even though present in the compost, would be unlikely to reach maturity in a mineral soil but might, however, do so in a soil of an organic or peaty character, and further that the beetle of Oryctes would not be attracted to the compost for the purpose of laying eggs whether the soil is of a mineral, peaty or loamy consistency.

G. H. C.

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Miscellaneous.

FURTHER NOTE ON USE OF CRUDE OIL TO PREVENT DAMAGE BY CRABS.

The January issue of this Journal contained a note by Mr. P. C. Fisher in which, from personal experience, he advocated the use of crude oil to prevent damage to bunds by crabs.

This note has drawn the following comments from Mr. R. J. Maclachlan, who has had much experience of this problem.

"We have been using crude oil, or Diesel Engine Oil, for the last 6 or 7 years. We found it wasteful to pour undiluted oil into the holes, many of which are not vertical so that most of the oil soaks into the sides of the hole instead of at once reaching the lower reaches of the tunnel where the crabs are lurking.

The following is our procedure:—

3 to 4 lbs. of slaked lime are mixed with 3 to 4 gallons of water; to this is added ½ to 1 pint of crude oil and one ounce of arsenical "white ant" powder. The value of the latter ingredient has not been proved by actual experiment, but both lime and crude oil have been tested by controlled experiments.

One or two cigarette tins of the mixture are poured down each active crab hole and the latter then blocked. The treatment is repeated at least once per month. Very rarely is a treated hole again used and in the course of time the crabs almost entirely disappear from the locality. Our experience has been that mild treatment with regularity over a long period is preferable to drastic measures. The former aims at progressively rendering the soil disagreeable to all crabs.

I have never found any evidence that crabs are actually killed by our treatment.

It is instructive to note that after heavy rain which waterlogs the soil, large numbers of the dredger crabs come to the surface and crawl about in a dazed condition. They can then be killed with a stick.

Crabs do not thrive in drained and cultivated soil. We have found it advantageous to dig a small drain about 20 to 30 feet on the inner side of the bund, to intercept seepage. However watertight the bund itself may be, there is horizontal seepage through the soil under the bund.

If the strip of land behind the bund is soaking with brackish water, crabs will flourish there and tunnel into and under the bund itself."

RENT ON LAND PLANTED WITH COCONUTS AND OIL PALMS IN THE F.M.S.

The Federated Malay States Government has decided that the concessions in the matter of rent on coconut and oil palm lands which were in force in 1937 shall be extended until the end of 1938.

The Government, however, reserves to itself the right to refuse any further extension of the concessions beyond the end of 1938 irrespective of the market prices of coconut and oil palm products.

The concessions under reference are as follows:—

(i) COCONUT LANDS: in the case of lands exceeding 10 acres in area:

(*a*) the rent on planted areas already enjoying the rebate for land cultivated with coconuts under the Land Rules and paying $2 an acre will be reduced to $1 per acre;

(*b*) unplanted areas will also pay $1 per acre only.

In the case of lands not exceeding 10 acres in area, the effect of the concession will be to reduce the rent, which is in the majority of cases less than $2 per acre, by half.

(ii) OIL PALM LANDS: a rebate will be given of 50 per cent. of the rent payable with a minimum of $1 per acre on planted and unplanted areas.

Applications for either of these concessions should be made to the Collector of Land Revenue of the district in which the land is situated. The question of the eligibility of applicants for the concession is a matter for the discretion of the State authorities.

DERRIS PLANTING.

The Department of Agriculture is approached from time to time by firms interested in the purchase of derris root, for particulars of growers of this crop in Malaya.

The Agricultural Economist therefore invites planters interested in derris cultivation to notify him early of future production, giving particulars of quantity which will be available, origin of planting material, and stating when harvest is expected.

MARKET FOR PAPAIN.

A firm in Canada is anxious to enter into correspondence with planters who are in a financial position to open up from 50 to 100 acres of papaya for the purpose of producing papain. Further information may be obtained from the Department of Agriculture, Kuala Lumpur. Please quote reference number D.A. 638/37.

Reviews.

Observations on Stem-Rot of the Oil Palm.

By A. Thompson, Special Bulletin, Scientific Series No. 21. Department of Agriculture, Straits Settlements and Federated Malay States, Kuala Lumpur, 1937, 28 pp., 14 plates. Price 50 cents (Straits currency).

Stem rot of the oil palm is serious only in areas of deep peat, or in quartzite valley soils with sand beds approaching the surface, though it may occur, to a lesser extent, on lateritic soils where rocky outcrops form a hard pan.

Mr. Thompson shews that the commonest form of stem rot disease is caused by the fungus *Fomes noxius* which penetrates the stem tissue *via* the leaf-bases. Palms are rarely killed until two or three years after infection. The author also gives an account of the fungus *Ganoderma lucidum* which is regarded as a facultative parasite and of *Fomes lignosus* which appears to be saprophytic on this host.

Regarding treatment of palms affected by stem-rot, excision of decayed tissue is advocated only for areas, particularly of deep peat, where economic yields are still obtainable and where, if the diseased palms were felled and supplies planted, growth of the supplied palms is unlikely to be satisfactory.

Although the disease penetrates through the cut leaf-bases, preventive painting of the cut surface of leaf-bases after pruning is not recommended, but as an alternative, the author suggests that "hat-peg" pruning, which helps to avoid wounds, confers a measure of protection.

"Stem-rot has been reported from the majority of oil palm estates in Malaya, but, except in areas where soil conditions are unfavourable to vigorous growth, it has not been extensive and cannot be considered as a serious menace to the industry, although when it was first discovered it had affected so many palms in the area involved, that it was regarded with considerable disquietude."

While these observations and conclusions are reassuring the fact remains that considerable loss may be occasioned by stem-rot of the oil palm, and planters will be well advised to make themselves familiar with the results of this investigation.

D. H. G.

Journal of the Rubber Research Institute of Malaya.

Vol. 8 No. 2, January 1938. Rubber Research Institute of Malaya, Kuala Lumpur, 143 pp. Price 50 cents (Straits Currency).

The current number of the Journal of the Rubber Research Institute of Malaya contains the following articles in addition to the Editorial and two book reviews:—

Experiments with Economic Tapping Systems (1) Part VI by C. C. T. Sharp.
Experiments on Tapping Systems by C. C. T. Sharp.
Note on the Introduction of New Clones for Use on Estates.
Report on a visit to Malaya, Java and Sumatra by R. K. S. Murray.
The Giant Snail *Achatina fulica* (Fer.) by F. Beeley.
Oidium Heveae by F. Beeley.
Nodule Bacteria and Leguminous Cover Plants by F. Beeley.
Selection of Rubber Factory Equipment by J. H. Piddlesden.
The Constituents of Hevea, Parts II, III and IV by K. C. Roberts.
The Uses of Statistics in Field Experiments with Rubber Trees by H. J. Page.

The Editor of the Journal summarizes the contents of this interesting number as follows:—

Tapping Systems.

" The previous issue of this *Journal* contains a paper by Mr. C. C. T. Sharp dealing with the results of the experiment on tapping-systems on Seventh Mile Estate for the third year, June 1935 to May 1936. The present issue contains a further paper by Mr. Sharp giving the results of the same experiment for the fourth year, June 1936 to May 1937, together with another paper by Mr. Sharp, being the substance of a lecture given at the Annual Conference of the Incorporated Society of Planters in September of last year, in which the results of this experiment for the first four years are summarized and discussed. Little need here be added to the editorial comments on the above-mentioned paper in the previous issue (page 2). In view of the uncertainty as to the behaviour of rubber trees in a lower yield-class, in relation to different tapping systems, further experiments are now being laid down on such rubber trees. It is interesting to record that independent evidence from various sources including these experiments agrees in showing that, so far as the beneficial effect on yield is concerned, resting from tapping need not exceed three months.

Commercial Planting of New Clones.

" One of the vexations of agricultural research is the long time which usually must elapse before the results of experiments can confidently be recommended for practical application. This is particularly true for a long-term crop such as the rubber tree. The practical planter who is in a position to use a promising new clone would often like to "back his fancy" by using it for commercial planting,

notably in connection with a replanting programme. The advice given by the Institute, however, must be as free from uncertainty as is reasonably possible, and for that reason the Institute's policy is based on the principle that the value of a new clone can be assessed with sufficient certainty only when the first buddings of the clone are at least 10 years old, and have been tested under a normal tapping-system for not less than five years. In order to speed things up as much as possible it is naturally desirable that the preliminary period of selection and testing should not unduly delay the critical testing of such clones as may be finally selected. There are different ways of setting about this; these are described and discussed in a circular written by Mr. Mann, which has recently been issued from the Botanical Division, and which is reprinted in this issue of the *Journal* for general information.

Report on Mr. Murray's Visit.

" It is always stimulating to compare planting practices and opinions in different countries. This is particularly true in relation to bud-grafting in its technical and commercial aspects. This was the principal *raison d'être* of the visit of Mr. R. K. S. Murray, Botanist and Mycologist to the Rubber Research Scheme (Ceylon), to Malaya and the Netherlands East Indies at the end of 1936. Extensive extracts from his report on this visit are therefore included in this issue of the *Journal*. Much in this report will be familiar to many Malayan planters, and to agricultural scientists concerned with rubber-growing. It is valuable, however, that facts or opinions on matters which do not yet command common agreement among all planters, should be seen through the eyes of a visitor from another country, who is able to combine the necessary scientific knowledge to enable him to form an opinion, with a greater freedom from bias or prejudice than the local man is liable to have. It is also of great value to study the way in which differences in soils and other environmental or economic conditions, as between different rubber-growing countries, affect the relative importance of different aspects of rubber-planting. The published extracts from Mr. Murray's report can be read with much profit in these connections, and here it suffices to point out that with regard to the principal object of the visit—yields of bud-grafted rubber in commercial practice—Mr. Murray states that "these results show beyond the possibility of doubt that yields greatly in excess of those to be expected from unselected seedling material at similar ages are being obtained in estate practice, and it is almost certain that appreciably larger yields will be obtained from younger clearings which are planted with better clones".

The Giant Snail.

" This is one of the most troublesome pests in many districts, frequently causing serious damage both to young rubber plants and to cover plants. A very notable advance in the methods for the control of this pest consists in the discovery—of unknown origin—of the fact that "Meta", material hitherto used primarily as a dry fuel for domestic purposes, for heating kettles and the like, is a deadly poison for these pests. The method of its application, in the form of a bran-bait, and the

results of tests carried out at the Institute's Experiment Station, are dealt with in a paper by Mr. Beeley in this issue. The method would prove needlessly expensive as a sole means of keeping the pest in check year-in, year-out; but it seems to be unapproached by any other known method, as a means of rapidly reducing an infestation to a low level such that it can then be kept permanently in check by the use of calcium arsenate-lime-cement bricks.

Oidium Heveae.

" Mr. Beeley's report on the incidence of Hevea leaf-mildew in 1937 has been purposely held back until this issue of the *Journal* in the belief that it will be read with greater interest at a time when this year's Oidium season is imminent. The climatic conditions during the latter part of 1936 and the early part of 1937 were particularly favourable for the study of the relation between the incidence of this disease and meteorological conditions. On the whole the attack in 1937 was quite a mild one, and there is nothing to indicate that the prevalence or virulence of the disease is on the increase in this country.

Leguminous Cover-Crops.

" Although leguminous cover-crops can commonly be established with comparative ease in areas of young rubber trees, on the majority of Malayan soils it proves extremely difficult or impossible to establish or retain them in a mature stand. These failures are commonly attributed to the effect of heavy shade. That this cannot be the whole story is amply demonstrated by the fact that in some areas, exceptional but none the less authentic in Malaya, but more particularly in Sumatra, leguminous creeping covers flourish under shade. There must therefore be other factors at work. One of these is now well-recognised to be phosphate-deficiency, and phosphatic manuring may be one of the essential factors for success in the establishment and maintenance of such covers on many soils. A further important factor is that of the presence of the necessary nodule organism. Without the presence of the correct strain of organism, leguminous plants cannot form the nodules on their roots, on which they normally depend for their supply of nitrogenous plant-food. This aspect of the subject is now being actively investigated at the Institute and this issue of the *Journal* contains a paper by Mr. Beeley, being a reprint of a lecture given at the Annual Conference of the Incorporated Society of Planters in September last, which deals in some detail with the scientific aspects of this subject and with their practical application. It may well be that the effect of shade is the "last straw" for leguminous crops already suffering from deficiency of phosphate and perhaps other mineral nutrients, together with absence of the correct strain of nodule bacteria, and that if these two deficiencies are remedied the establishment and the maintenance of leguminous creepers under mature rubber on Malayan soils will be more generally feasible.

Factory Equipment on Estates.

" Marked advances have been made in recent years in the design of the equipment in estate factories, particularly with regard to sheeting batteries and smoke-houses. Such progress has now reached the stage that, to quote from the summary of the paper by Mr. Piddlesden in this issue "improvement and economies in the immediate future will be effected by attempts to make the best use of existing types of equipment rather than by violent departures from current designs." The Institute is constantly being asked to advise on the organisation and lay-out of estate factories, and the present paper summarizes the position, and in particular discusses the question of the proper co-ordination, in space and in time, of the various pieces of equipment and machinery, and their working, which are concerned in the conversion of field latex into smoked sheet.

The Composition of Latex.

" The previous volume of this *Journal* contains the first paper by Dr. Roberts on the results of his work on the composition of Hevea latex. The so-called "non-rubber solids" were shown to consist of, and were separated into, several well-defined fractions, the further study of which promised to throw considerable light not only on practical problems of latex processing and rubber manufacture, but also on the important fundamental problems of the functions of latex in the tree and the mechanism of its formation. This work has now been carried considerably further, and the present issue contains three more papers by Dr. Roberts. From the technological point of view one of the most important aspects of this work is that of its bearing upon the variability of raw rubber. There is a long-standing desire on the part of the manufacturers of rubber goods for standardization of the raw material, though unanimity regarding the standards required has not yet been evinced. Variability of raw rubber depends partly upon variations in procedure in the estate factory during the conversion of latex into dry rubber, but it depends even more upon inherent variations in the latex itself, as obtained from trees of varying age and origin, on varying soils, and under varying climatic, meteorological, and tapping conditions. Dr. Roberts' work is an important contribution to this latter aspect of the subject, for by the study of the different characteristic fractions of the latex solids and their variation in amount and in composition, it should ultimately prove possible to interpret these inherent variations and the variations in vulcanisation and other properties, in chemical terms. Until the chemical nature of the variations in latex have been elucidated, it is impossible to say with certainty to what extent the effect of these variations could be obviated by changes in the subsequent treatment of the latex, or what the nature of those changes should be.

Modern Field Experiments.

" Experimental work in the field on the many and varied aspects of the cultivation of Hevea is now wide-spread. Not only is the programme of such experiments which are being carried out by the Institute or under the supervision of its staff, now a very extensive one, but many estates are also carrying on experimental

work of their own. Unless proper safeguards are available in the interpretation of the results of experiments, erroneous conclusions may easily be drawn, and if such erroneous conclusions are applied commercially on estates, considerable financial loss may result. During the past 10 or 15 years there has been a virtual revolution in the design and interpretation of field experiments, following the application of mathematical statistics to the subject, in which application R. A. Fisher was the pioneer and is still recognised as the leader. The mathematical considerations involved in the design of modern field experiments, and in the interpretation of their results, are too abstruse to be readily intelligible to any but the professional mathematician. On the other hand the reasons why ill-designed experiments may be so misleading as to be worse than useless, and the general principles underlying the design of modern experiments and the interpretation of their results, can be explained in non-mathematical language. An attempt has been made to do this in a paper by the Director in the present issue, which is the substance of a lecture given at the Annual Conference of the Incorporated Society of Planters in September last. It is believed that planters who are interested in carrying out experiments, but who are suspicious of the demands of agricultural scientists regarding the way in which such experiments should be laid out, will find that perusal of this paper helps to allay their suspicions; and that it will make them realize that the extra trouble involved in carrying out a properly-designed experiment is likely to be well worth while, by giving them results of a known reliability as compared with the possibility of drawing erroneous and expensive conclusions from wrongly-designed experiments."

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

February, 1938.

The Weather.

In North Kedah, some heavy showers during the first week of the month brought the rainfall well above the average for February. Heavy rainfall at this time of year is exceptional, for a dry January and February is a regular and pronounced feature of the North Kedah climate.

In Penang and Province Wellesley, similar but less severe showers also fell during the first week but the rainfall for the month was below the average.

Hot and dry weather prevailed generally and, with the exception of North Kedah, precipitation was below the average for the month at most stations from which records are received. These dry conditions were specially marked in Malacca and the adjoining areas of Negri Sembilan and Johore. On the East Coast rainfall was well below normal for the month both in Kelantan and Pahang.

Remarks on Crops.

Rubber.—The price of smoked sheet remained steady at about last month's quotations in most parts of the country. There was a tendency towards slightly higher prices for coupons and export rights with an equivalent decline for the price of rubber not covered by such rights.

In several reports details are given regarding the prices paid to tappers by small-holders. In Selangor, seven to eight cents a *kati* (1 1/3 lbs.) has been a common contract price and attempts made during the month to reduce this in Ulu Langat District were not altogether successful. In Negri Sembilan four to five cents a *kati* is now commonly paid, although the rate in some localities of this State still remains as high as seven cents. The common practice among small-holders of paying the tapper by allotting him a fixed proportion of the produce, known generally as the *bagi dua* system, is somewhat more complicated than formerly as the result of restriction regulations. From Perak South it is reported that the tapper still receives only half the rubber he obtains, but a common division in Selangor now is one-third to the owner and two-thirds to the tapper. It would seem that in this arrangement no account is taken of export rights, the whole of the coupons being retained by the owner so that the tapper can only sell his share of the produce at uncouponed prices.

The census of rubber sold by dealers in Batang Padang during 1937 is proving a lengthy business, owing to the difficulty of getting precise information from dealers' records. An experimental grading scheme has been started by the Asiatic Rubber

Instructor at Ijok in Kuala Selangor, in order to obtain some information as to what advantages may be expected from a grading scheme for small-holders' rubber and as to the methods most likely to be successful if any official grading scheme were instituted.

Padi.—It is as yet too early to venture an estimate of the Kedah crop, but both yields obtained from Test Stations and the general appearance of the padi in the fields indicate that the crop will be appreciably below average. An exception is the Baling District where good yields have been obtained and at the Test Station for the District (Pulai Station) yields of about 600 gantangs to the acre were harvested.

In Krian and the adjoining area of Sungei Acheh in Province Wellesley harvesting is in progress but it is anticipated that it will be more protracted than usual. The sealing of bags of the strain Seraup 48 in being done by Departmental officers in Krian as a guarantee of its suitability for the bonus of 10 cents a picul offered by the Government mills for this strain. Up to the end of the month 4,774 bags had been sealed and 90 per cent. of this received the bonus. Attempts are being made to bring the inspection to a higher standard so as to ensure that all sealed padi is definitely up to the standard required for the bonus. At present the grower is receiving on an average about 7.5 cents of the bonus of 10 cents which is paid the middleman who sells the padi to the mills. It is considered that, given the reliability aimed at in the inspection and sealing, the grower should receive at least eight of the ten cents premium.

Harvesting is in progress in the Sungei Manik area of Perak. It is too early to estimate the crop by comparison with that of last year, but in some areas of Stage II better crops are being reaped than last season.

At Panchang Bedena in Selangor a fairly good crop is expected notwithstanding the low rainfall through most of the growing period.

Both in Malacca and Kelantan the crop is expected to be better than that of last season.

Agricultural and Padi Stations.—There is nothing of special interest to record. During the dry weather only routine work could be done on Agricultural Stations and harvesting is either in progress or completed at most of the Padi Stations.

DEPARTMENTAL NOTES.

Visit of Sir Frank A. Stockdale, K.C.M.G., C.B.E.

Sir Frank A. Stockdale, Agricultural Adviser to the Secretary of State for the Colonies, concluded his official visit to Malaya on 4th March, 1938. He arrived in Penang on 28th February, and thus spent five weeks in this country.

Sir Frank first inspected centres of agricultural activity in Penang and Province Wellesley and then proceeded to Kedah. Travelling south he visited coconut and rubber estates, the Krian padi area, the Sungei Manik Irrigation Scheme and various Agricultural Stations in Perak.

A tour was made to Kelantan, Trengganu and Pahang after which the Research Stations and Headquarters of the Department of Agriculture and the Rubber Research Institute were inspected. A pineapple plantation and factory at Klang, rubber replanting and manuring were included in his tour of Selangor, Negri Sembilan and Malacca. Some days were spent in Singapore and Johore where several estates and Experiment Stations were inspected.

Returning to Kuala Lumpur, Sir Frank next proceeded for a two-day inspection of the agricultural activities of Cameron Highlands, after which he sailed for the Netherlands Indies.

Rural Lecture Caravan.

The Rural Lecture Caravan, operated jointly by the Departments of Agriculture and Co-operation and the Rubber Research Institute of Malaya, met with an accident in Negri Sembilan early in January which caused irreparable damage to the Caravan.

In consequence of this accident several tours were abandoned. Steps were immediately taken to equip a motor lorry for the resumption of the programme. This has been accomplished and the tours have now been resumed.

Meeting of the Agricultural Advisory Committee.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 3rd March, 1938, at which Sir Frank Stockdale was present. A résumé of the minutes of this meeting will appear in the *Malayan Agricultural Journal*, April 1938.

Statistical.

MARKET PRICES.

February, 1938.

Major Crops.

Rubber.—The market continued at a low level in February, but with a slight improvement in the second half of the month. Spot loose opened in Singapore at 22¾ cents per lb., and after minor fluctuations rose to 23⅛ on the 16th and to 24⅜ on the 23rd, closing at 23⅝ cents.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 23.13 cents per lb., as compared with 23.08 cents in January. The London average price was 7.03 pence per lb., and the New York price 14.65 cents gold, as compared with 7.07 pence and 14.54 cents gold in January.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, February, 1938.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.			Kuala Kangsar, Perak.		Batu Pahat, Johore.		
	3	17	24	9	23	9	16	23
Smoked sheet	28.50	27.98	28.79	26.90				
Unsmoked sheet	26.60		26.00		26.00	25.25	25.30	26.65
Scrap	20.00							

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Batu Pahat on the 2nd February, at Kuala Kangsar on the 2nd and 16th and at Kuala Pilah on the 10th February.

Palm Oil.—Prices fell further during February but there was a slight improvement at the close and the month's quotations for the Malayan commodities are given in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
February	4	£ 16. 10. 0	£ 10. 0. 0
,,	11	16. 0. 0	9. 10. 0
,,	18	15. 10. 0	9. 5. 0
,,	25	16. 15. 0	9. 15. 0

Copra.—The copra market continued to weaken considerably in February, and the level of $3.45 per picul reached on the 17th was the lowest since January 1935. The average price for the month of the sun-dried grade was $3.75 per picul, the mixed grade being 40 cents lower. The average prices for January were $4.41 and $4.05 respectively.

Copra cake continued unchanged at $1.80 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in January were as follows:—Siam No. 2 (ordinary) $4.11; Rangoon No. 1 $3.95; Saigon No. 1 $4; as compared with $4.14, $3.95, and $3.97 in December and with $4.95, $3.67 and $4.50 in January 1937.

The average retail prices in cents per gantang of No. 2 Siam rice in January were:—Singapore 28, Penang 32, Malacca 28, as compared with 28, 36 and 29 in December.

The average declared trade value of imports during January was $4.04 per picul as compared with $3.98 in December and $4.09 in November.

Padi.—The price of padi at the Government Rice Mills, Perak, was raised to $2.10 per picul. Retail prices of padi ranged from 6 to 15 cents per gantang.

Pineapples.—There was no change in the prices of canned pineapples per case during February and they were:—G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and $2.95 respectively.

Prices of fresh fruit per 100 for canning were as follows:—Singapore 80 cents to $1.40; Johore 1st quality 60 cents to $1, 2nd quality 40 to 80 cents, 3rd quality 20 to 50 cents. The Selangor factories were closed.

Beverages.

Tea.—Eight consignments of Malayan tea were sold on the London market during February. Three consignments were of upland tea and were sold at average prices of 1s. 1½d., 1s. 2¼d., and 1s. 2½d. per lb. respectively. The lowland tea was sold at average prices ranging from 1s. 0¼d. to 1s. 1¾d. per lb.

Average London prices per lb. during February for consignments of tea from other countries were as follows:—Ceylon 1s. 4.59d., Java 1s. 0.48d., Indian Northern 1s. 2.14d., Indian Southern 1s. 2.72d., Sumatra 11.49d.

The latest Colombo average prices available quoted from *The Weekly Tea Market Report*, 22nd February 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 86 cents, Medium Grown Teas 74 cents, Low Grown Teas 65 cents.

Coffee.—Prices remained almost unchanged, and averages per picul were:—Sourabaya $13.12 to $14.12; Palembang $10.23 to $11.30.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian $14; Excelsa $10; Robusta $7.

Spices.

Arecanuts.—The range of Singapore prices per picul during February was as follows:—Splits $4.56 to $7.06; Red Whole $6.69 to $9.69; Sliced $5.69 to $6.88.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $7.81, Medium $7.31, Mixed $6.88.

Pepper.—Prices were higher in Singapore during February with further improvement in the last week of the month. Average prices per picul for the month were as follows:—Singapore Black $9, Singapore White $14.50, Muntok White $15, as compared with $8.05, $13.50 and $14 respectively in January.

Nutmegs.—The Singapore market weakened considerably in February, the price of both 110's and 80's falling from $38 per picul to $32, with an average of $34.50 per picul as compared with $41.40 in January.

Mace.—Siouw was quoted throughout the month at $95 per picul, and Amboina at $75, as compared with January averages of $98 and $82 per picul respectively.

Cloves.—Nominal quotations remained unchanged at $40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for February at Rs. 1.35 to Rs. 1.52, falling at the close to Rs. 1.10 to Rs. 1.35 per lb.

Miscellaneous.

Derris (*Tuba Root*).—Limited buying by overseas consumers further depressed prices during February. Average prices per picul for the month were: roots sold on rotenone content $22, roots sold on a basis of ether extract $14, as compared with $25 and $15 respectively in January.

Gambier.—No. 1 Cube was quoted throughout February at $16 per picul as compared with an average price of $15.60 in January. Block fell to $7 per picul, averaging $7.56 as against $7.90 in January.

Tapioca.—Seed Pearl and Medium Pearl remained unchanged at $4.80 and $5.20 per picul respectively, while Flake Fair was quoted throughout the month at $4.25 as compared with an average price of $4.45 in January.

Sago.—Pearl, Small Fair, averaged $4.02 per picul, and Flour, Sarawak Fair, $2.35, as against $4.25 and $2.44 respectively in January.

Tobacco.—The general range of prices per picul was as follows:—1st quality $24 to $44, 2nd quality $23 to $38, 3rd quality $8 to $25. In Johore the range was from $12 to $50, and for prepared tobacco from $32 to $120. In Negri Sembilan the range for prepared tobacco was: 1st quality $55 to $60, 2nd quality $40 to $55, 3rd quality $35 to $45, and in Kelantan $100, $82.50 and $62.50 respectively.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

January, 1938.

Malaya.—Imports of foreign rice during January were 59,362 tons,† and exports 16,179 tons, net imports being 43,183 tons as compared with 43,387 tons in 1937.¶

Of the imports during January 52 per cent. were consigned to Singapore, 13 per cent. to Penang, 6 per cent. to Malacca, 25 per cent. to the Federated Malay States and 4 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 40,168 (67.7), Burma 16,629 (28.0), French Indo-China 1,612 (2.7), other countries 953 (1.6).

Of the January exports 74 per cent. were consigned to the Netherlands Indies and 26 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 13,050 (80.7), Burma 2,378 (14.7), French Indo-China 586 (3.6), parboiled 48 (0.3), local production 177 (0.7).

India and Burma.—Burma's total exports of rice and bran (*Bangkok Times,* 21st January 1938) from 1st January to 11th December 1937, were 3,119,566 tons as compared with 3,059,451 tons in 1936, an increase of 2 per cent.

According to the final forecast (15th February 1938) of the rice crop in Burma for the 1937-38 season, the area likely to mature is 12,534,300 acres, an increase of 426,400 acres as compared with the final figures for the previous season.

The surplus available for export is now estimated at 3,100,000 tons of rice and rice products which may be taken as equivalent to 4,189,000 tons of padi.

Siam.—According to the fourth report on the rice crop of Siam for the 1937-38 season, the cultivated area is given approximately at 7,812,638 acres, and the damaged area at 940,655 acres. The estimate of the exportable surplus remains unchanged at 1,583,333 tons.

Japan.—The latest information available was published in the October 1937 Summary.

French Indo-China.—Entries of padi into Cholon during January were 122,060 tons as compared with 141,498 tons in 1937, a decrease of 13.7 per cent. Exports of rice for the same month were 87,962 tons, as compared with 88,761 tons in 1937, a decrease of 0.9 per cent.

The Netherlands Indies.—The latest information available was published in the October 1937 Summary.

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* Abridged from the Rice Summary for January 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936 or 1937.

Ceylon.—Imports of rice during January were 39,974 tons as compared with 48,852 tons in 1937, a decrease of 18.2 per cent. Of these imports 12.6 per cent. were from British India, 76.9 per cent. from Burma, 1.9 per cent. from the Straits Settlements, and 8.6 per cent. from other countries. The corresponding figures for 1937 were 14.7, 70.9, 0.6 and 13.8.

Europe and America.—Shipments from the East to Europe during 1937 totalled 1,138,831 tons as compared with 1,386,012 tons in 1936, a decrease of 17.8 per cent. Of the 1937 shipments 37.9 per cent. were from Burma, 56.2 per cent. from Saigon, 4.4 per cent. from Siam and 1.5 per cent. from Bengal. The corresponding percentages for 1936 were 22.0, 67.5, 9.8 and 0.7.

Shipments to the Levant during 1937 totalled 16,296 tons as compared with 13,699 tons in 1936, an increase of 19 per cent. Shipments to Cuba, West Indies and America during 1937 totalled 227,958 tons, a decrease of 7.8 per cent. as compared with 247,329 tons in 1936.

FERTILIZER PRICES, FEBRUARY, 1938.

The following are the prices at the end of February, 1938, of some of the more important fertilizers. All quotations are *ex* Port Swettenham, F.M.S., or Singapore.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	50.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

MALAYAN AGRICULTURAL EXPORTS, JANUARY, 1938.

PRODUCT.	Net Exports in Tons		
	Year 1937	January 1937	January 1938
Arecanuts ...	30,084	4,087	3,084
Coconuts fresh † ...	95,223†	4,939†	5,043†
Coconut oil ...	39,762	2,579	3,058
Copra ...	75,592	4,275	5,690
Gambier, all kinds ...	1,955	126	181
Copra cake ...	15,026§	1,097§	653
Palm kernels ...	7,312	594	696
Palm oil ...	42,787	1,822	4,494
Pineapples canned ...	80,502	6,316	5,631
Rubber ¶ ...	503,127¶	39,909¶	40,024¶
Sago,—flour ...	15,478	1,812	39
,, —pearl ...	3,759	314	390
,, —raw ...	8,256*	591*	499*
Tapioca,—flake ...	1.058	143	101
,, —flour ...	2,393*	23*	247*
,, —pearl ...	18,786	1,875	1,261
Tuba root ...	573	94	25

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
January 1937	1,984.8	1,403.9*	360.4	232.8*
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates at 31st January, 1938 were: palm oil 3,977 tons; palm kernels 775 tons.

* Revised figures for U.M.S.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST JANUARY, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber not Tapped: Estates which have entirely ceased tapping		On estates which have partly ceased tapping: Otherwise than under rotational systems		Under rotational systems		Area of Tappable Rubber never been tapped		Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
				Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)	Acreage	Percentage of (11) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,658	26,479	60.7	—	—	8,510	19.5	8,669	19.8	482	1.1	17,179	39.3
Malacca ...	122,454	80,957	66.1	1,176	1.0	8,885	7.2	31,436	25.7	2,297	1.9	41,497	33.9
Penang ...	2,513	1,696	67.5	—	—	681	27.1	136	5.4	72	2.9	817	32.5
Singapore ...	32,694	21,593	66.1	1,547	4.7	5,111	15.6	4,443	13.6	145	0.4	11,101	33.9
Total S.S. ...	201,319	130,725	64.9	2,723	1.4	23,187	11.5	44,684	22.2	2,996	1.5	70,594	35.1
F. M. S.—													
Perak ...	290,291	211,172	72.7	774	0.3	26,681	9.2	51,664	17.8	7,374	2.5	79,119	27.3
Selangor ...	330,432	248,557	75.2	1,247	0.4	20,229	6.1	60,399	18.3	7,140	2.2	81,875	24.8
Negri Sembilan ...	257,005	186,952	72.7	1,567	0.6	21,877	8.5	46,609	18.2	8,300	3.2	70,053	27.3
Pahang ...	85,641	61,323	71.6	942	1.1	14,605	17.1	8,771	10.2	7,374	8.6	24,318	28.4
Total F.M.S. ...	963,369	708,004	73.5	4,530	0.5	83,392	8.6	167,443	17.4	30,188	3.1	255,365	26.5
U. M. S.—													
Johore ...	475,800	352,736	74.1	3,799	0.8	54,691	11.5	64,574	13.6	34,118	7.1	123,064	25.9
Kedah ...	199,411	150,265	75.3	3,326	1.7	9,563	4.8	36,257	18.2	5,623	2.8	49,146	24.7
Kelantan ...	31,161	22,338	71.7	263	0.9	3,935	12.6	4,625	14.8	2,365	7.6	8,823	28.3
Trengganu (b) ...	4,817	3,172	65.8	—	—	100	2.1	1,545	32.1	100	2.1	1,645	34.2
Perlis (c) ...	1,347	800	59.4	—	—	94	7.0	453	33.6	94	7.0	547	40.6
Brunei ...	5,054	3,369	66.7	—	—	668	13.2	1,017	20.1	899	17.8	1,685	33.3
Total U.M.S. ...	717,590	532,680	74.2	7,388	1.1	69,051	9.6	108,471	15.1	43,199	6.0	184,910	25.8
Total MALAYA ...	1,882,278	1,371,409	72.9	14,641	0.8	175,630	9.3	320,598	17.0	76,383	4.1	510,869	27.1

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JANUARY, 1938, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January 1938		during the month		January 1938						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan 1938	during the month	Jan. 1938	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,717	13,430	14,232	14,232	7,154	7,154	Nil	Nil	Nil	Nil	12,987	4,828	12,987	4,828	...	11,892	14,808	18	18
Johore ...	...	4,795	4,839	6,047	6,047	3,197	3,197	Nil	31	Nil	31	2,468	7,491	2,468	7,491	...	3,547	5,403	...	...
Kedah ...	...	586	3,543	3,754	3,754	1,328	1,328	Nil	Nil	Nil	Nil	2,444	2,399	2,444	2,399	...	458	3,910	...	...
Perlis ...	...	6	19	17	17	31	31	Nil	Nil	Nil	Nil	Nil	37	Nil	37	...	14	22	...	...
Kelantan ...	...	884	202	377	377	411	411	Nil	Nil	Nil	Nil	212	616	212	616	...	751	295	...	...
Trengganu ...	...	55	50	297	297	148	148	Nil	Nil	Nil	Nil	Nil	445	Nil	445	...	55	50	...	...
Brunei ...	...	Nil	75	56	56	55	55	...	...	...	...	...	90	...	90	...	18	78	...	...
Total Malay States	...	16,043	22,158	24,780	24,780	12,324	12,324	Nil	31	Nil	31	18,111	15,906	18,111	15,906	...	16,735	24,566	18	18
S. SETTLEMENTS :—																				
Malacca ...	...	2,217	1,311	1,509	1,509	384	384	Nil		Nil		1,783		1,783		...	2,693	1,410	...	...
Province Wellesley	...	2,943	809	584	584	151	151	Nil		Nil						...	3,035	829	...	...
Penang ...	4,299	5,842	8	26	26	61	61	2,842	15,700	2,842	15,700	10,493	Nil	10,493	Nil	2,306	6,297	16	...	...
Singapore ...	7,911	26,762	202	179	179	24	24	14,155		14,155		17,599		17,599		6,386	33,525	256	25	25
Labuan ...	...	43	Nil	Nil	Nil	2	2	81		81		Nil		Nil		...	40	Nil	...	...
Total Straits Settlements ...	12,210	37,807	2,330	2,298	2,298	622	622	17,078	15,700	17,078	15,700	29,875	Nil	29,875	Nil	8,692	45,590	2,574	25	25
Total Malaya ...	12,210	53,850	24,488	27,078	27,078	12,946	12,946	17,078	15,731	17,078	15,731	47,986	15,906	47,986	15,906	8,692	62,325	27,140	43	43

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	10,757	32,295	6,029	5,415	2,930	221
WET RUBBER	1,135	1,230	268	371	617	237
TOTAL ...	11,892	33,525	6,297	5,786	3,547	458

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. 1938 31
Singapore ...	29,578	29,578
Penang ...	14,774	14,774
Port Swettenham	3,544	3,544
Malacca ...	90	90
MALAYA ...	47,986	47,986

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. 1938 34
Malay States ...	33,896	33,896
Straits Settlements	2,806	2,806
MALAYA ...	36,702	36,702

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.* Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 25th February, 1938

METEOROLOGICAL SUMMARY, MALAYA, JANUARY, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.9	71.2	80.5	93	68	84	74	83.4	84.2	5.39	136.9	1.14	16	13	2	3		208.35	6.72	56
Bukit Jeram, Selangor ...	88.0	71.9	79.9	92	69	82	74	83.7	85.7	5.86	148.9	1.29	18	14	2	1		238.10	7.68	64
Sitiawan, Perak ...	88.6	72.4	80.5	92	68	82	74	83.7	84.1	6.79	172.5	2.43	17	15	2	2		226.05	7.29	62
Ipoh Aerodrome, Perak ...	90.6	71.0	80.8	95	67	81	74	83.2	83.8	2.91	74.0	1.05	10	9	1			231.60	7.47	63
Temerloh, Pahang ...	85.9	70.6	78.0	90	67	76	73	83.4	84.7	6.28	159.5	1.08	21	16	1	2		185.75	5.99	50
Kuala Lipis, Pahang ...	86.0	70.1	78.1	90	67	77	72	82.1	83.3	5.65	143.5	1.11	19	12		14		173.60	5,60	47
Kuala Pahang, Pahang ...	83.4	74.3	78.9	85	71	80	79	81.0	82.9	11.96	303.8	2.93	25	23			5	189.95	6.13	51
Kallang Aerodrome, S'pore ...	85.2	73.9	79.5	89	70	79	76	80.7	82.2	12.25	311.2	3.19	18	15		1	2	146.05	4.71	39
Bayan Lepas Aerodrome Penang ...	88.8	73.1	80.9	92	70	84	76	82.9	84.0	5.66	143.8	2.64	6	5				280.85	9.06	77
Bukit China, Malacca ...	87.2	72.8	80.0	92	70	81	74	81.7	83.1	3.85	97.8	1.34	14	11	1		3	211.05	6.81	57
Kluang, Johore ...	84.9	71.3	78.1	91	69	76	73	79.6	81.2	4.31	109.5	0.87	15	14	1	2	1	164.70	5.31	44
Bukit Lalang, Mersing, Johore	81.8	73.9	77.9	85	70	76	78	79.0	79.7	11.48	291.6	2.57	18	18	1		6	180.25	5.81	48
Alor Star, Kedah ...	89.1	70.3	79.7	92	67	84	75	82.0	84.1	1.18	30.0	1.12	3	2		1		290.35	9.37	79
Kota Bahru, Kelantan ...	84.8	71.6	78.2	87	67	81	76	80.6	82.5	3.84	97.5	0.64	18	17				235.40	7.59	64
Kuala Trengganu, Trengganu	82.5	72.7	78.1	86	69	79	77	79.7	81.2	3.66	93.0	1.10	18	15		3	1	205.70	6.63	56
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	68.9	60.2	64.5	74	57	64	63	69.6	70.6	7.12	180.8	1.40	22	18		24	1	155.65	5.02	42
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.2	56.4	63.8	74	49	67	63	69.3	69.9	2.46	62.5	1.16	14	10			2	182.95	5.90	49
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.0	57.5	64.3	75	53	64	61			2.50	63.5	1.19	14	10			2	189.80	6.12	51

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, JANUARY, 1938.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs	Gale force 8 or more	Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.9	71.2	80.5	93	68	84	74	83.4	84.2	5.39	136.9	1.14	16	13	2	3		208.35	6.72	56
Bukit Jeram, Selangor ...	88.0	71.9	79.9	92	69	82	74	83.7	85.7	5.86	148.9	1.29	18	14	2	1		238.10	7.68	64
Sitiawan, Perak ...	88.6	72.4	80.5	92	68	82	74	83.7	84.1	6.79	172.5	2.43	17	15	2	2		226.05	7.29	62
Ipoh Aerodrome, Perak ...	90.6	71.0	80.8	95	67	81	74	83.2	83.8	2.91	74.0	1.05	10	9	1			231.60	7.47	63
Temerloh, Pahang ...	85.9	70.6	78.0	90	67	76	73	83.4	84.7	6.28	159.5	1.08	21	16	1	2		185.75	5.99	50
Kuala Lipis, Pahang ...	86.0	70.1	78.1	90	67	77	72	82.1	83.3	5.65	143.5	1.11	19	12		14		173.60	5,60	47
Kuala Pahang, Pahang ...	83.4	74.3	78.9	85	71	80	79	81.0	82.9	11.96	303.8	2.93	25	23			5	189.95	6.13	51
Kallang Aerodrome, S'pore ...	85.2	73.9	79.5	89	70	79	76	80.7	82.2	12.25	311.2	3.19	18	15		1	2	146.05	4.71	39
Bayan Lepas Aerodrome Penang ...	88.8	73.1	80.9	92	70	84	76	82.9	84.0	5.66	143.8	2.64	6	5				280.85	9.06	77
Bukit China, Malacca ...	87.2	72.8	80.0	92	70	81	74	81.7	83.1	3.85	97.8	1.34	14	11	1		3	211.05	6.81	57
Kluang, Johore ...	84.9	71.3	78.1	91	69	76	73	79.6	81.2	4.31	109.5	0.87	15	14	1	2	1	164.70	5.31	44
Bukit Lalang, Mersing, Johore	81.8	73.9	77.9	85	70	76	78	79.0	79.7	11.48	291.6	2.57	18	18	1		6	180.25	5.81	48
Alor Star, Kedah ...	89.1	70.3	79.7	92	67	84	75	82.0	84.1	1.18	30.0	1.12	3	2		1		290.35	9.37	79
Kota Bahru, Kelantan ...	84.8	71.6	78.2	87	67	81	76	80.6	82.5	3.84	97.5	0.64	18	17				235.40	7.59	64
Kuala Trengganu, Trengganu	82.5	72.7	78.1	86	69	79	77	79.7	81.2	3.66	93.0	1.10	18	15		3	1	205.70	6.63	56
HILL STATIONS. Fraser's Hill, Pahang 4268 ft.	68.9	60.2	64.5	74	57	64	63	69.6	70.6	7.12	180.8	1.40	22	18		24	1	155.65	5.02	42
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.2	56.4	63.8	74	49	67	63	69.3	69.9	2.46	62.5	1.16	14	10			2	182.95	5.90	49
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.0	57.5	64.3	75	53	64	61			2.50	63.5	1.19	14	10			2	189.80	6.12	51

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

APRIL, 1938.

EDITORIAL.

Tea In June of last year we published an article in this Journal on "The Malayan Tea Industry". The article in question reviewed the position at that time in relation to the participation of Malaya in the International Tea Agreement.

The Agreement which Malaya entered into at the beginning of 1937 terminated at the end of March of this year and negotiations about the conditions under which this country is prepared to enter a new Agreement have been the subject of comment in the Federal Council and in the local press.

As a basis for negotiation the Department of Agriculture has revised and brought up-to-date the Malayan tea statistics. The publication of this information in the present number will be of interest to the industry and an aid in the negotiations.

Those concerned with the planting of tea in Malaya will be interested to learn that, at the suggestion of Government, the United Planting Association of Malaya has formed a committee to appoint a delegate to state their case before the International Tea Committee, and to endeavour to reach mutually satisfactory terms with that body. It must be remembered that the International Tea Committee is an unofficial body; all other countries conduct their negotiations in the first instance through Tea Planters' Associations, and schemes agreed upon by the trade are eventually laid before the Governments for their approval or otherwise. In taking this step, Malaya is therefore only falling into line with the present established practice in this connexion. His Excellency the Governor has nominated the Adviser on Agriculture as an official member of this local committee to represent the small-holders and to act as liaison officer.

While it is hoped that these negotiations will not be protracted, it is inevitable that some time must elapse before an agreement can be announced. Such delay might disorganize the planting progamme of a number of Malayan tea estates, as all licences to plant automatically expired at the end of March 1938, when the present Tea Agreement terminated.

To obviate this difficulty and as a measure of relief of the present labour situation, the Government of the Federated Malay States, in anticipation of an increased area under the next Agreement with the International Tea Committee, is prepared

to consider the issue of new licences to plant up to the end of 1938. As this is a measure of relief of the labour situation, it is to be understood that any licence issued at the present juncture is conditional on the work being put in hand at once.

A review of a recently-published bulletin of the Department of Agriculture entitled "The Cultivation of Lowland Tea at the Central Experiment Station, Serdang" appears in this number. The original intention was to publish a comprehensive book on the tea investigations at Cameron Highlands and at Serdang. The untimely death of the officer in charge of the Highlands work delayed the preparation of the account of the experiments at Cameron Highlands. It has since been prepared from records at the Station and is published in this number. With the special bulletin and this number of the Journal, the tea planter in Malaya possesses an up-to-date statement of the tea industry in this country, and can compare the claims of upland and lowland tea cultivation. Whatever arguments may be advanced for upland or for lowland tea planting, the accounts which we now publish conclusively prove that the cultivation of tea in Malaya is a profitable investment at the prices that have ruled in recent years.

Original Articles.

TEA AT THE AGRICULTURAL STATION, CAMERON HIGHLANDS.

Introductory.

In a recently published Bulletin, (1) an account is given of the cultivation, manufacture, and economics of lowland tea production at the Central Experiment Station, Serdang. An endeavour has been made in the present article to give a similar, though shorter, account of tea at the Agricultural Station, Tanah Rata, Cameron Highlands. As far as possible duplication of description of standard practices common to the Central Experiment Station and Tanah Rata has been avoided, but mention is made of any points in which practices at Tanah Rata differ in detail from those at the Central Experiment Station.

Situation and Climate.

The Agricultural Station is situated at the eastern end of the Tanah Rata valley at an elevation of between 4,700 and 5,000 feet above sea level. Most of the slopes on which tea has been planted have a western or southerly aspect, but as the Station is more or less surrounded by comparatively high hills, there is abundant shelter from high winds.

Temperatures range from about 50°F. at night to maxima of about 70°F. during the day. Occasionally, lower night temperatures have been recorded and freezing-point has been touched once since recording commenced. Seasonal variation is slight and it is very exceptional to experience temperatures below 45°F. or above 77°F.

Rainfall is well distributed throughout the year and at no time is flushing of the tea-bush appreciably delayed through drought. There are, however, fairly well-marked periods of dryer and wetter weather, the dry occurring in January-March and June-September. The total average rainfall is approximately 100 inches per annum, and monthly averages range from a maximum of 13 inches in November to a minimum of 3½ inches in July. Heavy storms are exceptional, and rain is frequently in the form of light drizzle and showers.

Relative humidity, a factor of great importance in the manufacture of tea, is fairly constant though subject to more variation than relative humidity on the plains. Means range from 93 to 95 per cent. saturation at 9 p.m. to 75 to 85 per cent. at 3 p.m. and monthly variation of means is comparatively slight. Exceptionally low humidities occur occasionally, generally during spells of northerly and north-easterly winds, and on a recent occasion a relative humidity as low as 30 per cent. saturation occurred at 2 p.m. Such figures are, however, rare.

More detailed climatic information is published by the Meteorological Department (2) which has maintained a recording station within a few hundred yards of the tea factory since 1925.

Soil.

The soils on which tea is grown at the Agricultural Station fall roughly into two groups. The first consists of weathered and decomposed granite overlaid by several inches of peat. The decomposed granite has become a red clay loam containing a large percentage of sand and gravel. Mechanical composition varies over a wide range, according to the texture of the original granite and in ravines, due to the action of the water resulting in concentration of the sand and the removal of the clay. In mineral foods, this granitic soil is for Malayan soils moderately good, averaging from 0.1 to 0.3 per cent. potash, 0.03 to 0.1 per cent. phosphorus, 0.2 per cent. nitrogen and 0.02 to 0.08 per cent. lime. Owing to the peat layer the organic content is high and averages about 12 per cent. Acidity is within the normal Malayan range, the pH being about 5.0.

The second group of soils consists of weathered quartz, containing usually a little clay washed from the granitic soil, with a peat layer above. These quartz soils consist of little but white sands and on mechanical analysis show less than 10 per cent. silt and clay. They are poor in the extreme, and as might be expected, give a very indifferent growth of tea.

A more detailed account of soils at Cameron Highlands has been published by Dennett ([3]), to which reference should be made for more precise information.

It is frequently supposed that soil wash and erosion is high and in view of the steep slopes it is not unnatural that those accustomed to the tropical downpours of the plains should be so misled. It is surprising, however, to note how little erosion has occurred on areas which were laid down to tea twelve years ago. On one or two small areas on the Station, erosion has been serious but these cases are quite exceptional and even on slopes of 20° to 30° no appreciable loss of top-soil has occurred. This is ascribable primarily to the rarity of heavy rains and secondarily to the peat layer which acts as a sponge and protects the finer particles of soil below. Further, the tea bush fortunately possesses a network of fine rootlets which in no small degree act as soil-binders. In spite of the lack of serious erosion, it is generally considered advisable to establish a cover crop, partly as a safety precaution and partly to prevent erosion of the peaty layer should heavy rain or wind occur after a dry spell has made the surface of the peat dry and powdery.

Planting and Areas.

Planting of tea on the Station commenced in 1926, and proceeded until 1932 by which time 43½ acres had been planted. No accurate survey has been made and acreages as stated must be taken as approximate only. Areas have been measured on the surface only, not on the horizontal in the customary survey manner, a fact which must be taken into account when comparing yields and dressings with those obtaining on commercial gardens where areas are surveyed in the standard manner. This as a factor of importance on steep slopes where surface area may be much greater than that shown on a plan. The areas planted between 1926 and 1932 are as shown below:—

				acres
1926	...	...	...	0.12
1927	...	...	...	4.92
1928	...	...	...	17.12
1929	...	...	...	0.91
1931	...	...	...	15.54
1932	...	...	...	4.94
Total	...	...	...	43.55

Later plantings include 4 acres in 1936-7, 1 acre of which was interplanted with *Aleurites Fordii,* the tung oil tree.

Most of the seed used was obtained from Assam, a number of different gardens supplying the various "jats." The "jats" used and the areas planted with them are as follows:—

	acres		acres		acres
Charali	5.6	Dhonjan	2.3	Mutijan	0.9
Amulguri	0.8	Rajghur	8.3	Arajan	1
Muttipong-Manipuri	0.9	Markong	1.7	China	2
Betjan	2.7	Singhajan	2.6	Local seed	1
Dangri	5.25	Kalijan	0.9	(Parent seed from Ceylon)	

In addition to the above, about 5 acres were planted with a mixture of Markong, Kalijan, Mutijan, Betjan and Arajan, and nearly 3 acres with plants propagated vegetatively (by etiolation) from mixed parents. A further area of 2½ acres of Rajghur was allowed to grow up for seed purposes.

Nursery practice in germination and establishment of seedlings was the same as that described for lowland tea in the previously mentioned bulletin (1), except that seedlings were generally transplanted to the field when 9 or 10 months old. In a few exceptional cases, older stumps were utilized, particularly for purposes ot supplying. Also, shading of germination beds was found to be unnecessary in the cooler and cloudier conditions of the hills.

A standard planting distance of 4 ft. square was adopted and the rows were planted up-and-down the slopes. Two experiments were laid down in 1932 to test yields obtained at various spacings from 4 x 4 to 3½ x 3 ft., but to date no significant differences have emerged, and on general appearance, convenience, and cost of original planting, it appears that the wider spacing is the most advantageous for the particular local conditions. The 4 x 4 ft. spacing gives a good, even table of tea after about five years provided the soil is of average good quality. On the poor quartzite soils, no semblance of a table has been obtained with this spacing, but planting would not be commercially of any value on such soils.

Cover Crops.

Several species of cover crops have been tried at the Station and the most successful include *Vigna oligosperma*, (*Dolichos Hosei*) and *Indigofera endecaphylla*. The latter has the disadvantage of rank growth. It is apt to grow into the crowns on tea bushes causing partial smothering, especially on slopes where it can grow horizontally into the lower rows of tea. *Vigna*, on the other hand, forms a dense close cover on the surface of the soil, shows no tendency to become rampant, and is almost ideal both for prevention of soil wash and for provision of a layer of decaying vegetable matter on the surface. It is apt to die out as the tea reaches maturity and forms its own shade, but by that time it has performed its main function of protecting the soil while the tea bushes are young.

Shade Trees and Green Manure.

Details of the shade trees and green manures planted for trial may be found in the Guide to the Station ([4]). A considerable number of species have been tried, but most of them appear to have some disadvantage, and it is becoming increasingly clear that shading of tea is not a necessity at this altitude on Cameron Highlands. *Albizzia moluccana* has made excellent growth, but has given rather too dense a shade and many trees have been removed recently. Another disadvantage is the size attained by this tree and the consequent damage to bushes when removal becomes a necessity. It is possible that trees of this nature are of more value in opening up the soil and providing a means of drainage than for the shade they give or the organic matter they may provide for the soil.

An experiment was laid down in 1933 to compare the effect on yield of inorganic manures and of green manure obtained from pruning of dadaps. Records of yields were kept until recently when the experiment was abandoned owing to the poor growth of dadaps and the paucity of prunings. Apart from this, no experiments on the effect of green manures have been made. The value of growing crops to provide organic matter is questionable where, as on the Station, there is already a considerable quantity of decaying vegetable matter in the soil in the form of peat, and where prunings from the tea bushes themselves are added to the soil at regular intervals.

Since the publication of the Guide, referred to above, in 1934, growth of *Tephrosia Vogelii* has continued to be good. It has a definite value as a contour hedge on the steepest slopes where some erosion is almost sure to occur in due course, as it forms a close hedge which can be further strengthened near ground-level by its own prunings. On good soil, it can be cut back several times a year and gives a heavy crop of foliage and stems which rot readily.

Windbreaks.

As has been previously mentioned, the Station is situated in a sheltered position where wind-damage is rarely, if ever, serious. Occasionally strong winds from the west and south-west blow up the Tanah Rata valley, and as a check to these, *Grevillea robusta*, the Silver Oak of Australia, has been planted in avenue

form along some of the paths. Growth has been good, especially on slopes where good drainage exists, and this tree is satisfactory for its purpose. It gives a little light shade to bushes in the vicinity, but it is not of a spreading nature, and has the further advantage of providing a good leaf-fall.

Plucking.

The process of plucking differs in no material manner from that described in Bulletin 29 (1) as practised at Serdang, except that the plucking cycle is usually made once in nine days, rarely in eight days. A small difference worthy of note is that under Highlands conditions there is less elongation of stem than in the lowlands; consequently leaf and bud form a higher proporton of the total plucking with corresponding increase in the proportion of finer leaf and less "red stem" in the made tea.

Plucking may be commenced during the second year from transplanting, that is to say about three years from the planting of seed in the nursery. During the first two years of plucking, efforts are mainly directed towards shaping the bush in such a way that it attains the maximum spread without becoming more than two to three feet high. Thus the process may be more correctly described as pruning, although the shoots plucked are made into tea, and definite cutting back of woody shoots is practised.

Pruning.

With the object of shaping the young bush satisfactorily, considerable care is necessary both in the amount of young wood removed and in the intervals between removal. In order to determine the optimum pruning periods for young tea, and the optimum amount of wood to leave between cuts, two experiments were laid down in April 1932. Experiment "K" consisted of a Latin Square with the following treatments:—

A. Pruned 1 in. above the previous cut at 3-monthly intervals.
B. Pruned 2 in. above the previous cut at 3-monthly intervals.
C. Pruned 1 in. above the previous cut at 6-monthly intervals.
D. Pruned 2 in. above the previous cut at 6-monthly intervals.

In this experiment, treatments were carried out until October 1933 (*i.e.* for eighteen months). Analyses of yields to March 1935 showed a significant superiority in treatment C, 1 in. pruning at 6-monthly intervals Observations on shape and appearance confirmed that this was the most satisfactory degree and interval of pruning.

The experiment has been carried on to the present date, but will shortly be closed down as the bushes are approaching maturity and no further useful results are likely to be forthcoming.

Experiment "J" was designed to test the optimum pruning interval combined with manurial treatments in young tea as above. Unlike the previous experiment, analyses to March 1935 showed no significant differences, but possibly this fact may be ascribed to the unsuitable locality of the experiment with consequent

uneven growth of tea and a high experimental error. The late Mr. Curtler left a note to the effect that observations confirmed the result of Experiment "K" in that pruning at 6-monthly intervals appeared to give the most satisfactory results. This experiment is also being terminated.

Having completed the "juvenile" pruning of the bushes eighteen months to two years after transplanting, plucking of crop normally proceeds in the usual manner until the bushes become twiggy and fall off in production of young shoots suitable for the manufacture of tea. Under estate conditions, this state is easily recognizable, and an experienced planter can observe at once when his tea needs a full pruning.

In an endeavour to determine the optimum pruning cycle, several experiments were laid down. The first was commenced in March 1929, and was continued until September 1937. It consisted of two adjacent blocks pruned respectively at 2 and at 3-year intervals. The actual yields recorded are of little value for statistical analysis, but it has long been obvious that the 2-year cycle was unsatisfactory, as the maximum crop is obtained about two years after pruning. The experiment was concluded at the end of 1937.

The second pruning experiment ("L") was designed to test the relation between the period of the pruning cycle and manuring before and after pruning; intervals were 2½, 3, 3½, and 4 years. The experiment was commenced in September 1932. Yield records up to September 1936 showed that the shortest cycle was significantly inferior, thus bearing out the observations of the two adjacent blocks mentioned in the preceding paragraph. No significance between yields of the 3-, 3½- and 4-year cycles has yet been proved, and the experiment is being continued.

In spite of the lack of significance between these figures, observation suggests that, in general, about a 3½-year cycle is the best under Highlands conditions with average plucking. The precise time is bound to vary according to the degree of plucking which has taken place, a heavy plucking naturally causing an excess of twiggy stems and "Banjhi," while a too-light plucking will allow the bushes to grow too high for the plucker to reach the young shoots. The question calls for investigation by yields of experimental plots as it is sufficiently obvious when pruning is required, even though the limits may vary by a year or eighteen months according to individual conditions and to organization of estate routine.

The manner of pruning may be either "clean," in which all the branches are cut back to within a foot of the main stem, or "rim-lung" in which most of the branches of the bush are clean pruned, one or two of the outer branches being left with leaves to act as temporary "lungs" as described on page 7 of Bulletin 29 (1) A somewhat complex experiment ("N") was laid down in February 1934 including a comparison of "clean" and "rim-lung" pruning with manurial treatments and time of application of manures. Results of this experiment are contradictory, as results to August 1935 showed significant superiority of "rim-lung" pruning after manuring, while the following year's results showed "clean" pruning before manuring significantly better than the "rim-lung" after manuring.

In an experiment of this nature where time of pruning of different plots varies, it is clearly unwise to draw any conclusions early, as the period following pruning (when there is no crop to pluck) must influence mean annual yields over several years.

The general practice on the Station has been to "rim-lung" prune and to manure after pruning. General observation now suggests that this may not be the best practice, consequently, the experiment is being modified by manuring all plots before pruning (and manuring none after), and by the introduction of a period of resting the bushes before pruning on some plots while plucking others up to pruning time.

Manuring.

The general practice on the Station has been to apply artificial fertilizers to the crop after pruning, and to apply them down alternate rows. The prunings from the bushes have been placed alternately between rows not receiving artificial fertilizers. After the leaves have fallen from the prunings, they together with the finer twigs have been incorporated in the soil by "envelope-forking." At the next pruning, the alternation of rows is reversed and artificial fertilizers applied between those rows where previously prunings were placed, prunings being placed where applications of fertilizers had previously been made. By this means, the complete area has received a forking and a layer of prunings once in about seven years. In addition to the above it has been customary to apply a dressing of artificial fertilizers to the whole area about the middle of the pruning cycle, *i.e.* about 18 to 24 months after pruning, thus allowng the area two full and two alternate-row dressings in about seven years.

The standard mixture of artificial fertilizers consisted originally of sulphate of ammonia 75 lbs., groundnut cake 107 lbs., bloodmeal 68 lbs., concentrated superphosphate 37½ lbs., and sulphate of potash 31 lbs. per acre. At the end of 1934, following indications of a manurial experiment, an extra 150 lbs. of sulphate of ammonia per acre was substituted for the groundnut cake and bloodmeal as it was thought that the cheaper form of nitrogen was equally effective.

In this connexion, Experiment "B" is of considerable interest, as it was laid down to compare the effect on yields of complete mixtures containing in one case nitrogen in organic form (groundnut cake and bloodmeal), in the second case in inorganic form (sulphate of ammonia), and in the third case as a mixture of inorganic and organic forms. Results from September 1932, when the experiment commenced, to August 1935 showed that all treatments gave significantly higher yields than no treatment at all, but there was no significance between the various manurial mixtures. In 1935 manuring was deliberately omitted, and in 1936 manuring was omitted through an oversight which did not come to light until after analysis of figures. Mean yields obtained between August, 1935, and December, 1936, were higher from the manured plots than from control, but were significantly superior over control only in the case of the plots which had received nitrogen in organic form. The increased yield from organic over inorganic fertilizer, however,

did not even remotely approach the figure at which the high cost of organic manures would have been recovered. Annual mean yields per acre from each treatment are tabulated below:—

Year	Control	Inorganic	Organic	Mixture of Organic and Inorganic.
	lbs.	lbs.	lbs	lbs.
1934	828	987	1,002	967
1935	1,356	1,780	1,749	1,799
1936	1,882	1,959	2,049	2,047
1937	1,081	1,077	1,166	1,065

The experiment is being continued to determine the effect of manuring as the tea becomes older and the soil more exhausted.

Several other experiments have been laid down to compare the value of nitrogenous fertilizers alone against various combinations of nitrogen, phosphorus and potassium and against different quantities of complete fertilizers containing all three of these elements. The results obtained up to the present are so conflicting as to preclude the possibility of making any deductions whatsoever. Several of these experiments are being continued and the situation will doubtless become clearer in course of time when the fields have been in cultivation longer.*

Varieties.

A list of the "jats" and areas under each of them has been enumerated earlier in this article. Many of them appear far from pure in so far as variation from bush to bush is considerable even though the seed of one field comes from only one garden. Most frequent among the variation is a type which appears to be "China hybrid," perhaps originally from Ceylon stock, and characterized by slightly narrower and finer leaves together with abundant flowering and fruiting even in regularly-plucked fields.

In yield, no one "jat" appears to be outstandingly superior to others. Three experiments ("E," "F," and "G") were laid down in November 1932 to compare yields of various "jats," but unfortunately these experiments were sited on poor soil and uneven land, with the result that no conclusive evidence of superiority in

* Field experiments at Tocklai Experiment Station, India, which have been carried on for 17 years, show that sulphate of ammonia gives large increases in yield of tea. Where sulphate of ammonia is used to supply an equal quantity of nitrogen, these increases have been as large or larger than those obtained from organic manures such as oilcake, cattle manure or green manures. Similar results have, moreover, been obtained from experiments in other tea growing countries. At Tocklai, phosphates have had but little effect on yield and potash no effect on yield.—The Application of Science to Modern Tea Culture by P. H. Carpenter. *The Empire Journal of Experimental Agriculture*, Volume VI, No. 21.

yield of any one has been forthcoming so far. It is equally impossible to deduce any satisfactory evidence of relative yielding capacities from a consideration of the yields of individual fields of different "jats," owing to wide soil variation from field to field.

The position is similar with regard to the question of quality of the tea manufactured from different "jats." In 1936, crops of each "jat" were manufactured separately in order to ascertain whether any quality differences were apparent. The difficulties of making accurate and reliable comparisons are, however, almost insurmountable. Quality varies with the age of bushes, the precise stage of growth of the leaf when plucked, the time which has elapsed since pruning, and the weather conditions during manufacture. Furthermore, there is insufficient area of many of the "jats' on the Station to provide a full charge for a roller at any one plucking, with the result that some samples were correctly rolled while others probably were not. It is understood that the late Mr. Curtler was of opinion that "Mutijan" gave the most satisfactory quality, but no written record of this is available, and investigation reveals the fact that "Mutijan" was the only "jat" which was manufactured with a full roller-charge during the tests.

On field characters, many of the "jats" show a bud highly suitable for the manufacture of tippy teas. Some buds are long and firm and well-covered with silky hairs which remain on the young leaf during the earlier stages of unrolling and expansion. As the presence of such buds is by no means confined to one or even several "jats" it is possible that they may be as much a result of local conditions of climate or soil as any inherent character of a variety.

A small area of China tea has made very poor growth, and appears unsuited to local conditions. Many of the leaves develop with a curious twist and are thus deformed without any apparent insect attack. Yields have been much lower than those obtained from Indian "jats."

Yields.

Table I shows the yields obtained from individual fields of the Station, reduced for the sake of uniformity to a basis of made tea (20 per cent. of the yield of fresh leaf) per acre. The average yield at individual ages can be ascertained from this table. There is wide variation in yields owing to soil variations and to the fact that much of the tea was subjected to pruning and other experiments shortly after planting out. The mean can nevertheless be taken as approximately correct for average conditions on the Station.

It will be noted that the first yields are obtained about two years from transplanting, and that they rise steadily until the eight or ninth year when 900 to 1,000 lbs. of made tea per acre may be expected, a very satisfactory yield for tea at the altitude.

Seed-Bearers.

The seed-bearing area consists of 2½ acres of Rajghur "jat," planted in 1931, and 1 acre of Markong "jat" also planted in 1931 but plucked until

1936 and then allowed to grow up for seed purposes. Fifteen maunds of seed (about 1200 lbs.) were collected from the 2½ acre area in 1937, but this cannot be taken in any way as indicative of typical yield, as seed was only collected sporadically when required, and the area is no longer fully planted owing to removal of trees through disease or for other causes. In this connexion it is of interest to record that yields as high as forty maunds of seed per acre have been obtained in one year on a local estate, from seed bearers about eight years old.

Vegetative Propagation.

Experiments in propagation of some of the best bushes by etiolation have been made, and little difficulty is experienced in thus multiplying stock. It has been found to take approximately 6 months for etiolated shoots to form sufficient roots for transplanting. The method having been proved, propagation by this means was discontinued because of the slowness of the process and space required. Plants obtained by this means were utilized as supplies and have made satisfactory growth.

MANUFACTURE OF TEA.

Factory.

The factory as it existed until 1937 is described briefly in the Guide to the Station (4). Owing to increase in crop, enlargement became necessary and the old building was practically demolished and rebuilt with a second storey between July and December 1937. It now consists of an upstairs withering loft with two rooms, separated by a bulking chamber. Each room contains three double banks of withering "tats" of the same size as those previously utilized, while the central bulking chamber is supplied with fans which draw in air, and with a shaft conveying hot air from the furnace below.

Withering.

It is generally possible to obtain a natural wither of the fresh leaf within 48 hours, and enlargement of the space available for this process by the addition of second floor to the building has greatly facilitated such natural withers. Occasionally, when the leaf arrives at the factory in a wet condition, or when continuous rain and a saturated atmosphere lasts for 24 hours or more, it becomes necessary to resort to a little artificial heat. It is usual for the leaf to be in a sufficiently withered state after 36 to 48 hours even in the wettest weather if the temperature of the withering rooms is raised by 8° or 10°F. for a few hours. It is customary to use the minimum heat necessary to cause enough withering before the "tats" are required for a further charge of fresh leaf.

A wither entailing about 50 per cent. loss in weight of the fresh leaf is found to be the most satisfactory, though if a "tippy" tea is required a somewhat harder wither is better (bringing weight of withered leaf down to about 45 per cent. of the weight of fresh leaf), while a lighter wither (withered leaf about 55 per cent. of the weight of fresh leaf) gives a stronger-liquoring made tea. On the Station, it is

customary to make no deductions for moisture on leaf which is wet with rain or dew on arrival at the factory. On this basis, a 45 per cent. wither is aimed at, this figure corresponding roughly to a 50 per cent. wither estimated on a basis of fresh leaf free from surface moisture.

Rolling.

The general programme of rolling as described in the Guide to the Station ([4]) is still followed. Since the writing of this Guide, a second roller ("Economic" pattern, capacity 150 lbs.) has been installed.

Recently a slight alteration has been made by the separation of tea from the first roll in an attempt to obtain exceptionally "tippy" grades of Broken Orange Pekoe and Fannings. That is to say, it was previously customary to bulk all the fine tea from the first three rollings, whereas two separate grades are now being made, one from the fine leaf from the first rolling and another from the bulked fine leaf from the second and third rollings. The finest tea thus produced appears to have a sufficiency of "tip" to be classed as a "flowery" grade, but none has yet been sold on the London market, consequently the value of this modification in manufacture and grading is as yet undetermined.

Fermentation.

As noted in the Guide ([1]), it used to be customary to allow fermentation to proceed for some 6 hours. Earlier reports from London brokers show that the teas produced generally received various criticisms, the most frequent being that they were "dull." The time of fermentation was suspected as a possible cause. Varying periods of fermentation were therefore tried between May 1936 and March 1937, samples of the made tea being forwarded to London for valuation and criticism. The detailed reports on these samples are of sufficient interest to be quoted in full.

(1) "A" with four hours fermentation and "B" with six hours fermentation.

Report:—"We definitely prefer "A" as being brighter in the cup, though a little on the light side. "B" samples were inclined to turn slightly grey when milk was added."

(2) "A" with four hours, "B" with five hours, and "C" with six hours fermentation.

Report:—"We are definitely of opinion that the shortest fermentation (4 hours) is the most satisfactory of the three—the liquors are brisker and more pointy —though with possibly a little less colour.........".

(3) "A" with three hours, "B" with four hours, "C" with five hours fermentation.

Report:—"The liquors of teas fermented 5 hours are dull and much inferior to (those of) the other experiments. We have selected samples fermented for 4 hours in preference to the 3 hours fermentation although we are not entirely satisfied with the former.........The 3 hours fermentation samples are admittedly slightly the better of the two but we think that the valuable extra strength from the longer fermentation will more than compensate for the only very slight loss in brightness."

It may be noted that full details of weather conditions were recorded during these experiments in order to rule out as far as practically possible influences of atmospheric condition on the fermenting tea.

As a result of this trial, general time of fermentation has been reduced to about four hours with a resultant improvement in quality of the tea. It must be remembered, however, that modification is frequently necessary according to the state of the atmosphere and the degree of wither undergone by the leaf prior to rolling. With a "hard" wither, lighter fermentation is desirable, while a suitable degree of fermentation is reached more rapidly on a warm, fairly dry day than when cold or rainy conditions prevail. The provision of additional withering space has greatly facilitated working to a standard of about four hours fermentation, as leaf can now be fully withered, a degree which was often unobtainable in the smaller and less well aerated withering room formerly used.

Although a four-hour fermentation has been decided as the most satisfactory standard to which to work, it is still necessary to make full use of the characteristic colour and smell developed in the fermenting leaf. The development of a coppery colour and disappearance of the "green" raw smell of the fresh leaf is always considered in determining the precise period of fermentation.

Firing.

The process of firing is as described in the Guide (4), except that it is customary to fire a second time. That is to say, on the first firing the tea is in the dessicator for 12 minutes, commencing temperature being about 125° to 130°F., and final temperature about 200°F. After cooling, it is again fired, but for 8 minutes only with a commencing temperature of about 150°F., and a final temperature again about 200°F. After firing and grading the tea is stored in lead-lined chests until ready to be bulked and repacked for shipment. Little moisture is absorbed during storage, and a final firing before shipment is not normally given.

Grading.

For a detailed description of grading and of the grades made, the reader is again referred to the Guide (4), as no material change has been made since this was written, except for the manufacture of the first tea from the first roll separately as described under the section "Rolling."

During the last three months, the average proportions of each grade produced have been as follows:—

		per cent.			per cent.
"Flowery" B.O.P.	...	15.6	P.	...	12.0
B.O.P.	...	13.1	"Flowery" F	...	2.9
B.P.	...	35.3	F.	...	4.4
O.P.	...	12.0	D.	...	4.7

Sieving and grading are done by means of sieves of brass wire. A recent article by Lamb (5) has shown that stamped aluminium sieves are probably preferable because less of the black resinous coating on the made tea is removed as dust,

and the quality of the graded tea is thereby enhanced. As a result of this, it is proposed to grade with stamped aluminium sieves in future, and the necessary sieves are on order.

ECONOMICS.

Opening Up.

Planting, maintenance and capital factory costs of the tea on the Agricultural Station are of little value for practical purposes, as many activities other than experiments on and manufacture of tea are carried out, thus making accurate costing difficult and misleading.

For purpose of comparison with lowland tea costs, a rough estimate of the cost of bringing into bearing an economic unit of tea, (say 200 to 300 acres) in the Highlands is shown below:—

		Cost per acre.
		$
Premium on land (a)	...	5.00
Quit rent, 4 years (a)	...	4.00
Survey fees and boundaries	...	2.00
Felling, clearing, burning (Sakai labour) (b)	...	40.00
Nurseries and seed	...	45.00
Propagating of cover crop	...	5.00
Access paths	...	3.00
Access road and bridges (c)	...	10.00
Lining, holing and planting (d)	...	20.00
Weeding, 4 years @ $1/50 per month	...	72.00
Centring, tipping and pruning	...	10.00
Drains, and silt pits, or minor terracing	...	10.00
Cooly lines	...	80.00
Staff accomodation	...	50.00
Factory and machinery	...	120.00
Implements	...	5.00
Miscellaneous and contingencies	...	24.00
Supervision	...	25.00
	Total	$530.00

(a) For 15 years lease, convertible at 15th year to 99 years lease on the payment of $30 per acre. Quit rent is raised to $5 an acre in the fifth and subsequent years.

(b) Costs of a rough clearing, without stumping.

(c) Reckoning two miles of average earth road at about $10 per chain.

(d) Practically no holing is necessary in the average soil of the Highlands.

From the above, it appears that there is little difference between the costs in the Highlands and in the plains of bringing tea into bearing. The total shown above is rather in favour of the Highlands, but account must be taken of the fact that these figures are on the low side. Most of them have been compiled from

information obtained from local owners of tea, some of whom have used second-hand machinery, have made use of modest approach roads or have exercised economy in other directions. $500 to $600 per acre may however be taken as a reasonable figure for the costs of bringing into bearing at about the fourth year of a small estate within reasonable distance of a good road without a resident salaried European manager.

Cost of Making Tea.

Accurate costs for manufacture of tea are kept at the Agricultural Station and may be taken as representative. For the period during which the factory was in action in 1937, average costs were as follows per lb. of made tea:—

			cents	cents
Plucking.—	Supervision	...	0.76	
	Labour	...	7.05	
			——	7.81
Factory.—	Labour	...	1.70	
	Cleaner	...	0.70	
	Grading	...	0.35	
	Packing (for storage)	...	0.10	
	Packing red stem	...	0.70	
			——	3.55
Engine.—	Oil fuel	...	0.54	
	Lubrication	...	0.16	
	Spares	...	0.20	
			——	0.90
Firewood.—		...	0.45	
Sundries.—		...	0.06	
			——	0.51
			Total	12.77

For marketing, the following are the average costs:—

Shipment to London.—

		cents
Cases	...	2.00
Lead	...	1.80
Packing	...	0.06
Delivery to port	...	1.66
Insurance	...	0.27
Ocean freight	...	3.88
Brokerage and charges	...	3.12
Miscellaneous costs	...	0.01
	Total	12.80

For local sale in 1 lb. packages.—

		cents
Paper	...	0.50
Lead	...	3.45
Labour	...	0.80
Solder	...	0.75
Charcoal, flux, miscellaneous	...	0.50
	Total	6.00

In compiling the above costs, no allowance has been made for European supervision or clerical expenses, as these are impossible to estimate accurately on the Agricultural Station. Comparing with costs at Serdang (1), it will be noted that lead and cases are more expensive. This is due to an increase in prices (lead to $25 per cwt., and cases to $1.05 each) since the quoted article was written.

Returns.

Table II gives the highest, lowest and average prices obtained on the London market for all grades of tea for the last five years. Prices have been affected by the restriction scheme.

Acknowledgment.

Most of the information above was accumulated by the late Mr. E. A. Curtler who was in charge of the Station from 1932-1937, and from whose notes the article has been mainly compiled.

References.

(1) Greig, J. L. The Cultivation of Lowland Tea at the Central Experiment Station, Serdang. Bulletin 29, General Series, Department of Agriculture S.S. and F.M.S.

(2) Annual Reports of the Meterological Department, F.M.S. and S.S.

(3) Dennett, J.H. The Soils at Cameron Highlands. *Malayan Agricultural Journal,* Vol. XX 1930, page 20.

(4) Curtler, E.A. Guide to the Experiment Station, Tanah Rata, Cameron Highlands, Bulletin No. 18, General Series, Department of Agriculture S.S. and F.M.S. 1934.

(5) Lamb, J. Grading Tea with Stamped Aluminium Sieves. ***The Tea Quarterly.*** Tea Research Institute of Ceylon, Vol. X. December 1937, page 191.

Table I.

Calculated Yields of Made Tea per Annum per Acre for each Field Age from Transplanting shown in Years.

Field No.	Area Acres.	Date Planted		Years.										
				2	3	4	5	6	7	8	9	10	11	12
1	0.12	Jan.	1926	79		179	469	644	633	1017	1558	1158	1358	1842
11	0.35	Nov.	1928		501	440	634	760	1034	749	684			
12	0.36	Oct.	1927	10	266	1306	266	1089	1643	794	1218	1564		
13	0.82	„		49	259	326	260	459	795	817	838	631		
14	0.93	„		41	148	128	129	309	777	596	828	916		
15	1.49	„			30	161	142	314	446	885	1145	906		
16	1.54	Nov.	1928	68	394	41	278	416	748	883	717			
17	1.91	Oct.	1928	115	635	241	252	815	1241	1032	717			
18	0.88	Sept.	1927	53	217	319	174	269	703	584	899	1141		
19	0.94	„		48	288	885	227	453	833	337	868	914		
20	0.38	Oct.	1927	7	202	535	198	634	998	582	973	1322		
22	0.14	Oct.	1928	214	617	599	1170	679	1749	2733	2148			
24	0.42	Nov.	1928	33	299	210	466	260	744	910	1205			
25	0.99	„		57	314	243	526	301	884	941	945			
26	0.94	„		50	210	148	369	586	462	837	1052			
28	0.60	„		69	301	227	679	894	532	840	1201			
29	0.93	„		48	214	176	464	631	523	892	1185			
30	0.61	Sept.	1928	183	399	334	922	1073	542	902	1073			
36	0.91	Nov.	1929	209	389	936	1031	793	1322	1249				
37	0.92	Nov.	1928	97	344	307	356	1036	1440	1272	970			
38	0.84	„		25	106	52	144	405	474	479	325			
39	1.10	„		23	115	18	161	424	451	517	220			
40	1.01	„		24	26	32	230	513	315	346	548			
41	1.02	„		124	375	315	573	718	1092	1049	1059			
42	0.71	„		317	689	507	921	1169	1198	2027	1455			
48§	0.14	„		104	498	350	—	54	437	623	399			
49	0.80	„		149	418	404	817	418	1161	1778	911			
50	0.53	Oct.	1928	27	112	88	614	1132	573	844	1420			
51	0.67	Nov.	1928	26	118	84	153	402	439	548	274			
21	0.70	May	1931		178	589	1323	1307						
23	0.82	„			141	491	939	635						
31	0.97	„		52	408	936	947	944						
32	0.89	„		70	581	960	576	676						
33	0.90	„		18	201	596	811	575						
34	0.96	June	1931	47	399	892	993	678						
35	0.91	May	1931		375	1069	1167	508						
43	0.86	„			208	683	1004	714						
44	0.96	June	1931	46	302	677	829	686						
45	0.99	„		9	258	650	843	577						
46*	0.86	May	1931	189	604	1317	1432	923						
47	1.20	April	1931	90	442	625	433	539						
52‡	2.55	Nov.	1931			217	359	280						
55	1.06	Nov.	1932		42	165	667	789						
56	1.06	„			31	115	501	694						
57	0.90	„			38	189	722	923						
58	1.00	„			44	208	807	968						
59	0.92	„			24	134	614	827						
		Mean		79	285	428	630	657	834	848	947	1069	1358	1842

§ This field was collar pruned in October 1932; since then the yield recorded above is only half the area, while the remaining area was used for etiolation of shoots.

* This field was pruned in July 1937; since then plucking has been discontinued as it is being left for seed bearers.

‡ This field was originally planted 12ft. x 12ft. for seed bearers. The bushes were pruned down in October 1934. Young stumps were interplanted in December 1936.

Table II.

Prices obtained for Various Grades of Tea per lb. between 1933 and 1937.

Invoice	Date of Sale	B.O.P.	B.P.	O.P.	P.	Fannings.
		pence	pence	pence	pence	pence
	1933					
1	6 Nov. ...	16.0	13.0	11.75	12.25	13.0
	1934					
2	9 April ...	14.50	13.75	13.25	13.25	13 25
3	2 July ...	13.25	13.00	13.00	13.00	12.75
4	19 Sept. ...	11.5	10.75	10.25	10.75	10.75
	1935					
5	14 Jany. ...	12.5	11.5	11.0	10.5	11.25
6	1 May ...	13.5	12.5	11.75	13.25	12.25
8	16 Sept. ...	13.5	12.25	12.25	12.5	13.5
	1936					
9	20 Jany. ...	12.75	12.5	12.75	12 5	13 5
10	1 April ...	13 0	12.5	12.25	13 0	14 0
11	18 May ...	12.25	12.5	13.0	13 25	13 25
12	10 Aug. ...	12.0	11.75	11.75	12.75	13.0
13	14 Sept. ...	12.75	12.5	12.75	13.0	13.0
14	4 Nov. ...	13.0	12.25	12.5	12.5	13.0
	1937					
15	13 Jany. ...	13.5	13.0	12.5	13.0	14.5
16	8 March ...	14.75	14.25	13.75	13.75	15.75
17	24 May ...	15.25	14.75	14.25	14.25	15.75
18	19 July ...	14.75	14.5	13.75	14.0	15.0
19	30 Aug. ...	15.0	14.75	14.0	14.0	15.5
Highest price obtained from each grade ...		16.0	14.75	14.25	14 25	15.75
Lowest price obtained from each grade ...		11.5	10.75	10.25	10.50	10.75
Average price per lb. on the above invoices		13.54	12.88	12.58	12.86	13.38

Note :— No Invoice No. 7 was sent to London.

THE MALAYAN TEA INDUSTRY IN 1937

BY

D. H. GRIST,

Agricultural Economist.

Prices.

The following table shews the average monthly prices in 1937 obtained for Malayan tea on the London market, and for comparison, the prices obtained on that market for the tea from other countries.

Table I.

Prices per lb.

1937	Malayan Number of Breaks Upland	Malayan Number of Breaks Lowland	Malayan Prices Upland	Malayan Prices Lowland	Ceylon	Java	India North	India South	Sumatra
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
January ...	3	9	1 1.42	1 0.04	1 3.52	1 0.16	1 1.30	1 1.09	0 10.96
February ...	1	5	1 3.75	1 1.37	1 4.10	1 1.38	1 1.93	1 2.00	0 11.60
March ...	1	3	1 2.50	1 1.75	1 4.98	1 1.66	1 2.44	1 2.16	1 0.29
April ...	2	8	1 3.75	1 2.38	1 5.51	1 2.57	1 2.91	1 4.15	1 1.00
May ...	2	2	1 3.00	1 2.12	1 4.85	1 1.88	1 2.20	1 3.99	1 0.70
June ...	2	5	1 2.50	1 1.75	1 3.15	1 1.42	1 2.78	1 2.54	1 0.22
July ...	3	6	1 3.00	1 1.75	1 3.22	1 1.59	1 3.25	1 2.50	1 0.40
August ...	2	4	1 3.00	1 2.50	1 3.63	1 2.25	1 5.18	1 2.86	1 0.77
September ...	3	8	1 3.25	1 1.87	1 4.48	1 3.26	1 5.16	1 3.15	1 1.17
October ...	1	6	1 3.75	1 2.62	1 4.87	1 3.06	1 4.12	1 3.48	1 1.16
November ...	2	6	1 3.50	1 1.75	1 3.86	1 1.86	1 2.85	1 2.98	1 0.45
December ...	2	6	1 2.00	1 0.88	1 2.89	1 0.69	1 1.81	1 2.15	0 11.59
	24	68							

The average prices per lb. of Malayan tea on the London market during 1937 were: Upland 1s. 2.9d., Lowland 1s. 1.7d., as compared with Ceylon 1s. 4.00d., Java 1s. 1.76d., India North 1s. 3.05d., India South 1s. 2.69d., Sumatra 1s. 0.20d.

The range of prices of Malayan tea on the London Market was: Upland 1s. 1d. to 1s.3¾d. per lb., Lowland 11¾d. to 1s.3d.

Areas.

Under the International Tea Agreement, Malaya undertook that the area planted between the end of 1936 and 31 March 1938 should not exceed 3,000 acres. The planting of tea was allowed only under licence, and by the end of 1937 licences had been issued for the planting of 2,295 acres. Licences were then due for renewal to cover the first quarter of 1938. In a number of instances licensees were unable to plant the full amount allotted, generally owing to the shortness of time to prepare the land and to raise stock to a suitable size. The area actually planted by the end of 1937 was 801 acres. Licences were renewed to plant 1,020 acres—395 acres Lowlands, 625 acres Highlands—before the end of March 1938, when the present Agreement terminates. As great care has been taken to ensure that applicants did not apply for permission to plant an area larger than is within their means, it is anticipated that practically the whole of this 1,020 acres will be planted by the end of March 1938, so that Malaya will then have a total area of 5,265 acres as against the total of 6,683 acres allowed under the Agreement.

The area of tea on small holdings at the end of 1937 was estimated to be 559 acres, distributed as follows:— Johore 49, acres, Selangor 460 acres, Negri Sembilan 32 acres, Perak 6 acres, Pahang 5 acres, Penang 2 acres, Malacca 4 acres, Province Wellesley 1 acre.

The area of tea on estates, with years of planting, is given in Table II.

Table II.

Area planted with Tea, Malaya.

(Estates only, shewing years of planting)

Acres.

	Before 1930	1930	1931	1932	1933	1934	1935	1936	1937	Total Area	Reserve Land
Upland Estates ...	106	336	163	96	43	53	272	349	623	2,041	3,858
Lowland Estates ...	1,090	186	17	—	—	6	83	85	178	1,645	2,546
Total ...	1,196	522	180	96	43	59	355	434	801	3,686	6,404

The total area of tea in Malaya at the end of 1937 was 4,245 acres (estates 3,686 acres, small holdings 559 acres). The area of reserve land held by registered estates amounts to 6,404 acres. This figure does not, however, represent the total area on which tea may be planted, or which has been alienated for tea-planting.

Production.

The production of tea on estates during 1937 slightly exceeded 1 million lbs., of which 411,544 lbs. were sold locally and 583,052 lbs. exported. Stocks of made tea held by estates at the end of the year amounted to 54,143 lbs., as compared with 48,020 lbs. at the end of 1936. The detailed figures, and comparisons with previous years, are given in Table III.

Table III.

Malayan Production and Exports of Tea.

(Estates only)

in lbs.

Year	Upland			Lowland			Total		
	Produced	Exported	Sold Locally	Produced	Exported	Sold Locally	Produced	Exported	Sold Locally
1930	—	—	—	95,040	35,730	59,310	95,040	35,730	59,310
1931	—	—	—	127,988	31,000	95,662	127,988	31,000	95,662
1932	4,382	—	3,161	138,694	16,472	123,101	143,076	16,472	126,262
1933	39,440	6,990	29,958	172,449	59,952	118,997	211,889	59,942	148,955
1934	115,874	44,072	64,510	228,497	74,843	152,789	344,371	118,915	217,299
1935	212,927	163,787	30,431	418,735	238,189	173,583	631,662	401,976	204,014
1936	327,796	253,308	79,162	616,970	397,074	210,788	944,766	650,382	289,950
1937	373,767	183,026	182,431	627,304	400,026	229,113	1,001,071	583,052	411,544

In view of the fact that the area of new planting in the years 1932-1934 inclusive was small, and would only just be coming into production in 1937, it was not expected that there would be any great increase in production in the year under review. It is probable, however, that the 1935 plantings will affect production figures in 1938.

Imports.

As anticipated, the improved economic position of Malaya resulted in increased tea drinking, and consequent increase in the net imports of tea. The total net imports increased by 1 million lbs. to a total of 4,880,627 lbs., the highest figure reached since 1931, but still greatly below the record figure of 1929. Net imports and values thereof, are given in Table IV.

Table IV.

Net Imports of Tea into Malaya.

Year	Black		Green		Total Net Imports	
	Quantity lbs.	Valu	Quantity lbs	Value $	Quantity lbs.	Value $
1923	—	--	—	—	6,828,977	2,391,264
1924	—	—	—	—	7,176,274	2,783,349
1925	--	—	—	--	7,825,840	3,138,327
1926	—	—	—	—	9,664,809	3,947,613
1927	—	—	—	—	9,539,195	4,041,901
1928	—	—	—	—	8,647,440	3,769,141
1929	—	—	—	—	10,152,422	3,885,275
1930	—	—	—	—	8,732,453	2,872,220
1931	—	—	—	—	6,845,748	1,665,644
1932	3,498,909	725,119	944,474	290,450	4,443,383	1,015,569
1933	2,404,482	537,059	836,135	317,091	3,240,617	854,150
1934	3,264,661	764,634	1,177,582	472,211	4,422,243	1,236,845
1935	2,674,599	717,118	1,384,957	507,068	4,059,556	1,224,186
1936	2,307,188	408,769	1,587,405	498,135	3,894,593	906,904
1937	2,709,302	440,905	2,171,325	625,962	4,880,627	1,066,867

Imports of black and green tea were not shewn separately prior to 1932.

The gross imports of tea in 1937 were 3,842,393 lbs. black and 2,038, 923 lbs. green tea, a total of 5,881,316 lbs., of which less than 20 per cent. came from countries within the International Tea Agreement.

Consumption.

The consumption of locally-produced estate tea increased in 1937 by 221,594 lbs. to a total of 411,544 lbs., while exports of locally-produced tea declined by 67,330 lbs. to a total of 583,052 lbs.

The total consumption of tea may be taken as the sum of net imports, Malayan estate tea sold locally and estimated production on small holdings. The Malayan consumption in 1937 was therefore about 5,542,000 lbs. as compared with 4,435,000 lbs. in 1936.

An Estimate of Production 1938-1942.

The following estimate of Malayan production of made tea is based on yields of tea obtained at the Central Experiment Station, Serdang, and the Experiment Station, Cameron Highlands, applied to the data of areas planted given in Table II.

Table V.

Estimate of Tea Production in Malaya, 1938-1942.

Lbs. of Made Tea.

	1938	1939	1940	1941	1942
Uplands ...	449,000	545,000	659,000	831,000	1,072,000
Lowlands ...	803,000	994,000	1,205,000	1,271,000	1,444,000
Total ...	1,252,000	1,539,000	1,864,000	2,102,000	2,516,000

Received for publication 16th February 1938.

Reviews.

The Cultivation of Lowland Tea at the Central Experiment Station, Serdang.

By J. L. Greig. Special Bulletin, General Series No. 29, Department of Agriculture, Straits Settlements and Federated Malay States 1937. 31 pp. 8 plates. Price 50 cents (Straits currency) or 1s. 2d. post free.

The present volume gives an account of the experiments on the cultivation of tea conducted at Serdang over a period of 10 years and the system of tea manufacture adopted at the Station, together with the figures of yields for 1936 and estimates for costs of bringing an estate into bearing and of producing made tea. The bulletin is therefore a summarized statement of the investigations of the Department on the production of lowland tea in Malaya and the conclusions given may be taken as an authoritative official statement of the recommendations of the Department of Agriculture on the merits of lowland tea production in Malaya.

The preface states that the original intention was to publish a comprehensive book setting forth the investigations of the Department at Cameron Highlands and at Serdang as the publication of the data from these two Stations would have provided an interesting comparison between highland and lowland tea in Malaya. Owing to the death of the officer in charge of the Highlands' work this course was not adopted. The comparison can, however, be made, as the account of the investigations at Cameron Highlands is published as an article in the *Malayan Agricultural Journal* Vol. XXVI No. 4, April 1938.

Mr. J. L. Greig covers the experiments at the Central Experiment Station, Serdang, through every stage of the field operations of tea growing, and states the history and yields of each block area. Climate, manufacture, costs and sales are treated in detail, leading to his conclusions, in which he states:—

"If tea is established on suitable soil, which has not been impoverished by leaching or previous cultivation, yields of 1,000 lbs. of made tea per acre per annum may be expected and the pruning cycle extended to thirty months and even longer. In areas where soil conditions are poor, or where for any reason the stamina of the bushes is not maintained, extensive attack by termites may be expected........

"Measures are described which were successful in enabling an area of tea to combat the attacks of termites induced by soil conditions and drought..............

"The price realized (for the sale of made tea) compares favourably with that obtained for teas produced in other more important tea-growing countries."

Much has been said and written regarding the position of Malaya as an actual and potential producer of tea. A perusal of this bulletin will leave the reader in no doubt as to the suitability of this crop to Malayan conditions of soil and climate. The added advantage which Malaya possess of being a considerable consumer of tea—most of which is at present imported—should convince the capitalist who interests himself in Malayan tea production and studies the demand of the local market that with judicious propaganda a good market for the producer is at hand. No difficulty has been experienced in the profitable sale for local consumption of Serdang tea.

D. H. G.

Rubber Growing. Elementary Principles and Practice.

Compiled by A. Moore. Planting Manual No. 7, Rubber Research Institute of Malaya, Kuala Lumpur. 82 pp. Numerous illustrations. January, 1938. Price 50 cents.

The problem of organizing a service which shall enable the Asiatic small-holder to benefit from the results of the research work of the Rubber Research Institute of Malaya was met by the inauguration of a special Small-holders' Advisory Service in 1934. The staff of this Service has been built up by recruiting Asiatics—Malays, Chinese and Indians—trained at the School of Agriculture, Malaya, and at the Institute.

However industrious may be the individuals who form this band of 24 Instructors, they cannot hope to give advice directly to more than a very small proportion of the thousands of owners of holdings planted with rubber, without the assistance of adequate means of propaganda. Hitherto this has been supplied through the Malay, Chinese and Tamil agricultural journals of the Department of Agriculture, and by the lectures, demonstrations, films and lantern-slides which form the "stock in trade" of a rural lecture van, operated jointly by the Departments of Agriculture and Co-operation and the Rubber Research Institute.

The visit of the Caravan to any one district is necessarily rare and continued instruction must therefore rest with the Instructors. As an aid to their work they should find that the latest addition to the literature published by the Rubber Research Institute is of inestimable value. Compiled and prepared for publication by Mr. A. Moore from material supplied by members of the staff of the Rubber Research Institute and in consultation with the Department of Agriculture, S.S. and F.M.S., this book will be of very real service to small-holders and the owners of small rubber estates, and by its publication the Institute responsible has shewn an appreciation of the needs of the Asiatic planter in this country.

In the small compass of about 80 pages the compiler has given a simple statement of the principles and the present position of rubber planting, while the illustrations are not only an added attraction to the volume, but demonstrate the lessons urged in the text.

The writers waste no words in the presentation of facts. This brevity is most commendable for the purposes for which the book is written. A very good instance of this is provided by Chapter 12 under the title "The Selling of Rubber". The chapter consists of 18 lines, the purport of which is to urge that the rubber should be kept clean, dry, and should be graded. The chapter is supported by three photographs. The first shews rubber on the roadside and is accompanied by the legend "Sheet should not be left lying at the roadside. The dust from the road makes it dirty." The second illustration is of loose sheet rubber in a bullock cart, below which we read "When taking sheet to the dealer it should not be carried unprotected on a cart or on the back of a car or bicycle, because in this way it

becomes very dirty". The third illustration is of sheet rubber ready for enclosing in matting. The legend appended states: "Sheets should be kept clean and when taken to the dealer should be wrapped. Matting is suitable for wrapping and can be used many times." The compiler had at his disposal much information on selling rubber which would have made an imposing chapter, but the additional information would have had no bearing on the selling of rubber by small-holders.

The book is published in English and will therefore be more suited for distribution or sale to owners of small estates, as most small-holders cannot speak or read English. The simplicity of the style in which it is written will, however, make it understandable to many with but a small command of the language, and will make the work of translating into the vernacular comparatively easy. Advantage will be taken of the organization of the Department of Agriculture for the production of agricultural information in the Malay, Chinese and Tamil languages and it is anticipated that Mr. Moore's excellent Manual will be available in these languages before the end of this year.

D. H. G.

Fruit.

Compiled by the Intelligence Branch of the Imperial Economic Committee. 84 p. H.M. Stationery Office, London, 2s. 8d. post free.

Malayan interest in this publication centres in the section dealing with canned fruits. The position is reviewed up to the end of 1936, and the report presents a useful summary of the world statistical position and of the share which the Empire holds both as a producer and consumer.

As a consumer of canned fruits the United Kingdom holds first place, importing 86 per cent. of canned fruit from the chief exporting countries. This surprisingly high figure has probably been reached as a result of efficient propaganda. In view of the increasing supplies of canned pineapples being produced in Malaya it would appear that money spent on propaganda in certain other countries might materially assist an industry which seeks, and is in urgent need of, new markets.

The competition of one fruit with another for public favour is stronger at the present time than it has ever been. The reader of this summary should not therefore be content to examine only that portion which concerns the fruit in which he is interested, but should study the report as a whole to enable a comparison to be made of the popularity of certain fruits in particular markets

Vegetable Oils and Oilseeds.

Imperial Economic Committee, 110 p.p. H.M. Stationery Office, Kingsway, W.C.2, December 1937. Price 2s. 6d. net.

The Intelligence Branch of the Imperial Economic Committee has compiled a summary of figures of production and trade relating to cotton seed, linseed, rapeseed, sesame seed, soya beans, groundnuts, copra, palm kernels, palm oil and olive oil under the above title.

It is pointed out that statistics of area and production of the various oilseeds and nuts are generally too incomplete to permit of a satisfactory estimate of the trend of total world production. Many are annual crops and the amounts of these harvested from year to year fluctuate considerably according to weather conditions in the major producing countries or to price movements. Furthermore, the quantity of most of the oilseeds and nuts exported is small in relation to the total output, owing to consumption in countries of production concerning which it is generally impossible to obtain information.

The statistical information which is offered concerning exports of individual oils and oilseeds from various countries and the destination of these exports is however most comprehensive and provides a valuable guide to the trend of world trade. In the appendices detailed statistics of production in respect of soap, margarine and compound lard are also provided, and striking differences in the method of utilizing oils and fats in the three leading consuming countries are revealed.

F. C. C.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

March, 1938.

The Weather

The rainfall was above the average for the month at most stations from which records were received.

This applies more especially to Selangor, Negri Sembilan, the northern part of Malacca and to the East Coast where the precipitation was very considerably in excess of normal for the period.

Remarks on Crops.

Rubber:—The prices offered for smoked sheet by dealers in the rural areas at the end of the month ranged between about $22 and $24 a picul which represents a decline of $4 or $5 a picul during the month. The quotations recorded in reports for coupons per picul equivalent ranged from $12 to $20 and quotations per picul for rubber without coupons exhibit a similar wide range, being from $5 to $10.

It is recorded in several reports that the decline in price has resulted in fewer coolies being employed for tapping on peasant holdings and a tendency for owners to extract only sufficient rubber to cover their coupon quota. The Selangor report records that in that State most holdings can produce their average quota of 55 kati per acre per quarter in one month, and points out that the price of $7 to $9 a picul for uncouponed rubber shows little if any return except by owner-tapping.

The trial grading scheme at Ijok in Kuala Selangor is reported to be running smoothly and 2nd grade rubber is now prepared, whereas formerly it was 3rd or 4th grade. As mentioned last month this experiment is designed to indicate the lines on which any grading scheme for small-holders' rubber is likely to prove successful.

Padi:—Harvesting is practically completed in Kedah, Perak Central, Negri Sembilan and Malacca. In Krian District of Perak and in the Sungei Acheh area of Province Wellesley, wet weather has badly interfered with the harvest and has resulted in high reaping costs and in some loss of grain. Similarly, wet weather has damaged the ripening crop of wet padi in Kelantan.

Harvest is in progress at Sungei Manik in Lower Perak but has not yet begun in the Panchang Bedena and Tanjong Karang areas of Kuala Selangor.

In Krian 35,436 bags of Seraup 48 had been sealed up to the date of writing the March report as a guarantee that it is suitable for the premium of 10 cents a picul offered by the Government Mills for this strain. The inspection of this grain

and sealing of the bags is now working satisfactorily. Not all the padi so sealed find its way to Government Mills, for competition has led some private mills to offer a higher premium for this strain than the Government rate.

In Province Wellesley, Krian and Batu Kurau, Perak, certain cultivators are considering the erection of small power rice mills with the object of milling rice for surrounding cultivators for payment in kind in the form of a fixed percentage of the rice milled. In Batu Kurau a mill has been operating on this system for some time past.

FERTILIZER PRICES, MARCH, 1938.

The following are the prices at the end of March, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotation for sulphate of potash is *ex* warehouse, Port Swettenham F.M.S. or Singapore. All other quotations are *ex* warehouse Port Swettenham, Klang or Singapore.

DEPARTMENTAL NOTES.

Tour of the Rural Lecture Caravan.

The Rural Lecture Caravan, operated jointly by the Department of Agriculture, the Co-operative Department and the Rubber Research Institute of Malaya, carried out a successful tour of the Perak Central Circle between 20th February and 9th March 1938 and, in all, ten centres were visited. With one exception, the Caravan remained in each centre for two days.

The programme of lectures and films was varied in different centres to suit local agricultural conditions. As experience gained elsewhere shewed that afternoon lectures were poorly attended, no lectures were given in the afternoon but the subjects were included in the evening programme. It is estimated that the total attendance during the tour exceeded 15,000 people.

The system of interspersing educational subjects with items of a lighter nature finds favour. A film depicting the Coronation of H.M. King George VI is extremely popular wherever shewn, while the film concerning the Malay Regiment is also a favourite. This lighter entertainment not only makes the educational film and lantern lectures more palatable, but is of undoubted value in itself in giving a wider outlook on world affairs and making the peasantry more receptive of innovations in agricultural practice and co-operative ideas.

A visit to a district is treated as a prelude to a more intensive campaign in which by personal visits and demonstrations the officers concerned seek to ensure that there shall be a practical application of the propaganda for which the Caravan organization is responsible.

The response to this method of propaganda varies, but there can be no doubt that the Rural Lecture Caravan is serving its purpose in bringing to the villages some appreciation of the improvements in rural conditions that are possible.

Leave

Major C. D. V. Georgi, O.B.E., (Senior Chemist) has been granted 273 days leave from 12th March to 9th December, 1938. Dr. T. A. Buckley, Chemist, will act as Senior Chemist during the absence of Major Georgi.

Mr. G. E. Mann, M.C., Principal School of Agriculture, Malaya, returned from leave on 24th March, 1938.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE HELD ON 3rd MARCH, 1938.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 3rd March 1938, at which Sir Frank A. Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies, was present. The Adviser on Agriculture, Malay States, (The Hon'ble Mr. O. T. Faulkner, C.M.G.) took the chair.

The following are some of the more important matters discussed at the meeting.

The Coconut Industry.—The Committee was informed of the position regarding the small inexpensive copra kilns designed for the use of small-holders and small producers of copra.

Under the conditions obtaining during the original trials at Klang it was possible to obtain dry white copra in under 24 hours leaving a quantity of shell fuel after each run, surplus to requirements.

Subsequently, however, it was found that these results could not be repeated under all conditions in the field if the original working programme was strictly adhered to, although dry, white copra could be obtained if the operating time was increased or if more fuel was used.

The kilns have since been proved to be sensitive to changes in the conditions of operation while it is suspected also that the character of the meat of the coconut varies seasonally and in different localities. Investigations are therefore being continued.

Copra grading and the increased shipping freights on copra were also discussed.

The Pineapple Industry.—The Chairman reported that a start had been made in erecting a model pineapple factory and laboratory at Johore Bahru.

Regulations governing standard can sizes have been published in the Gazettes, and the three States concerned have agreed in principle to all the important features of a pineapple grading scheme. Other points discussed were the accumulation of stocks of canned pineapples and new markets for Malayan pineapples.

Tea.—The meeting was informed of the present position of tea restriction negotiations. The possibility of production locally of green tea to satisfy at least part of the local demand was discussed.

Anti-Erosion Measures in Malaya.—A summary of the present position has been circulated to the Committee. The Chairman pointed out that though the existing legislation appears superficially to be adequate, its enforcement is a matter of some administrative difficulty and undertook to give further consideration to the matter.

The Director, Rubber Research Institute of Malaya, asked whether, in view of the large amount of rubber replanting now being undertaken, and the proposal to allow new planting after 1938, it would not be desirable if anti-erosion measures were laid down in the conditions under which replanting and new planting were permitted under the new Rubber Regulation. After discussion the Meeting agreed that the Adviser on Agriculture and the Director, Rubber Research Institute, should discuss the matter further with a view to approaching Government on the subject.

At the invitation of the Chairman, Sir Frank Stockdale gave in confidence a preliminary outline of the views on Malayan agriculture in general which he had formed during his tour of the country. Various points arising therefrom were discussed.

STANDARD CANS FOR PINEAPPLES

Regulations have been brought into force in the Straits Settlements, Federated Malay States and Johore under Pineapple Industry Ordinances or Enactment* to standardize the size of can used for the packing of pineapples. The regulations do not apply to any can which is of such a size that its gross weight when filled is 3¼ lbs. or over, nor to cans of pineapple juice.

The following are the ten specifications of cans:—

Type or description of can	Overall diameter inches	Overall height inches
¾ lb. Squat ...	3 7/16	2 3/16
1 lb. Tall ...	3 1/16	3 13/16
1 lb. Squat ...	3 13/16	2 5/16
1¼ lb. Tall ...	3 1/16	4 1/2
1¼ lb. Squat ...	4 1/16	2 11/16
1½ lb. Tall ...	3 7/16	4 1/4
1½ lb. Squat ...	4 5/16	2 3/4
2 lb. Tall ...	3 13/16	4 3/8
2½ lb. Tall ...	4 1/16	4 7/8
3 lb. Tall ...	4 5/16	5 1/2

*F.M.S. Notification No. 896. F.M.S. Government Gazette of 1 March 1938. Enforced from 1 March 1938.

S.S. Notification No. 272. S.S. Government Gazette of 28 January 1938. Enforced from 1 May 1938.

Johore Notification No. 1391. Johore Government Gazette of 29 December 1937. Enforced from 1 March 1938.

Statistical.

MARKET PRICES.

March 1938.

Major Crops.

Rubber:—The month was notable for the severe fall in the rubber market, the closing price of 16⅜ cents being the lowest since the pre-restriction period of 1934. Spot loose opened in Singapore at 23⅜ cents per lb.; there was a gradual weakening throughout the month, the price falling to 20 cents on the 24th and, after a slight recovery, to 17⅛ cents on the 30th and 16⅜ cents at the close.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 21.74 cents per lb., as compared with 23.13 cents in February. The London average price was 6.69 pence per lb., and the New York price 13.62 cents gold, as compared with 7.03 pence and 14.65 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table 1.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, March, 1938.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.			Kuala Kangsar, Perak.		Batu Pahat, Johore.				
	3	10	17	23	30	2	9	16	23	30
Smoked sheet	28.00	27.60	27.80	20.90	23.00					
Unsmoked sheet		26.00			20.00	24.96	25.10	25.50	22.59	18.09
Scrap										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 2nd, 9th and 16th March, and at Kuala Pilah on the 24th and 31st March.

Palm Oil.—Prices again weakened during March as shewn in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1938		Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
March	4	£ 16. 5. 0	£ 9. 15. 0
„	11	16. 0. 0	9. 10. 0
„	18	15. 5. 0	9. 7. 6
„	25	14. 10. 0	9. 5. 0

Copra.—The slight recovery in the copra market was not maintained, and Singapore prices fell steadily throughout the month from $3.90 per picul on opening to $3.55 at the close. The average price for the month for the sun-dried grade was $3.68 per picul, the mixed grade again being 40 cents per picul lower. The February average price was $3.75 per picul.

Copra cake was unchanged at $1.80 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in February were as follows:— Siam No. 2 (ordinary) $4.15; Rangoon No. 1 $3.82; Saigon No. 1 $3.92; as compared with $4.11, $3.95 and $4 in January, and with $4.66, $3.67 and $4.02 in February 1937.

The average retail prices in cents per gantang of No. 2 Siam rice were unchanged from January and were:— Singapore 28, Penang 32, Malacca 28.

The average declared trade value of imports during February was $3.85 per picul as compared with $4.04 in January and $3.98 in December.

Padi.—The Government Rice Mills, Perak, continued to pay $2.10 per picul for padi, and retail prices in various parts of the Peninsula ranged from 6 to 14 cents per gantang.

Pineapples.—There was no change in the prices of canned pineapples per case during March, and they were:— G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and 2.95 respectively.

Prices of fresh fruit per 100 for canning were as follows:— Singapore 80 cents to $1.50; Johore 1st quality 90 cents to $1.30, 2nd quality 60 to 90 cents, 3rd quality 40 to 60 cents.

Beverages.

Tea.—Five consignments of Malayan tea were sold on the London market during March. Two consignments of upland tea averaged 1s. 2¾d. and 1s. 3d. per lb., and the lowland tea averaged from 1s. 0½d. to 1s. 2d.

Average London prices per lb. during March for consignments of tea from other countries were as follows:— Ceylon 1s. 4.87d., Java 1s. 0.92d., Indian Northern 1s. 1.84d., Indian Southern 1s. 3.68d., Sumatra 11.93d.

The latest Colombo average prices available, quoted from *The Weekly Tea Market Report*, 29th March 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 82 cents, Medium Grown Teas 71 cents, Low Grown Teas 64 cents.

Coffee.—Prices of Palembang and Sourabaya coffee were considerably lower during the month than in February. Sourabaya averaged $10.95 to $11.75 per picul and Palembang $7 to $8, as compared with $13.12 to $14.12 and $10.23 to $11.30 respectively.

Prices in Singapore of other varieties of coffee were as follows (per picul):— Liberian $14, rising to $14.50, closing at $14; Excelsa $10, improving to $10.50; Robusta $7, falling to $6.50.

Spices.

Arecanuts.—The range of Singapore prices per picul during March was as follows:— Splits $5 to $6.85; Red Whole $5.15 to $6.30; Sliced $7 to $8.57.

The averages of the Singapore Chamber of Commerce quotations per picul were:— Best $7.88, Medium $7.83, Mixed $6.88.

Pepper.—No interest was shewn in the pepper market during March and prices fell again. Average prices per picul for the month were as follows:— Singapore Black $8.75, Singapore White $14.56, Muntok White $15.06, as compared with $9, $14.50 and $15 respectively in February.

Nutmegs.—The Singapore market fell still further during March, and the average price per picul for both 110's and 80's was $30.50 as compared with $34.50 in February.

Mace.—Siouw was quoted throughout the month at $90 per picul, and Amboina at $75, as compared with $95 and $75 in February.

Cloves.—Zanzibar and Amboina continued to be quoted nominally at $40 per picul.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for March at Rs. 1.08 - Rs. 1.28 rising to Rs. 1.15 - Rs. 1.31 per lb.

Miscellaneous.

Derris (*Tuba Root*).—Roots sold on rotenone content averaged $24 per picul as compared with $22 in February, and roots sold on a basis of ether extract continued unchanged at $14 per picul.

Gambier.—Prices fell still further during March and averages for the month were Block $7.38 per picul and No. 1 Cube $15.88, as compared with $7.56 and $16 respectively in February.

Tapioca.—Prices remained unchanged during March and were, per picul:—Flake Fair $4.25, Seed Pearl $4.80, Medium Pearl $5.20.

Sago.—There was a slight improvement in sago prices during March. Pearl, Small Fair, averaged $4.06 per picul and Flour, Sarawak Fair, averaged $2.37, as compared with $4.02 and $2.35 respectively in February.

Tobacco.—In Johore, prepared tobacco ranged from $30 to $100 per picul. In Kelantan the range was: 1st quality $100, 2nd quality $82.50, 3rd quality $62.50. The corresponding range in Negri Sembilan was: $58, $48, $38. The general range of prices for dried leaf was: 1st quality $24 to $47, 2nd quality $29 to $38, 3rd quality $20 to $30.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2

GENERAL RICE SUMMARY*

February 1938.

Malaya.—Imports of foreign rice during the month were 68,900 tons† and exports 16,498 tons; net imports were accordingly 52,402 tons as compared with 51,230 tons in 1937¶.

Of the February imports 53 per cent. were consigned to Singapore, 15 per cent. to Penang, 7 per cent. to Malacca, 22 per cent. to the Federated Malay States and 3 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 44,583 (64.7), Burma 20,918 (30.4), French Indo-China 2,482 (3.6), other countries 917 (1.3).

Of the imports during February 76 per cent. were consigned to the Netherlands Indies and 24 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 12,045 (73.0), Burma 3,659 (22.2), French Indo-China 629 (3.8), parboiled 57 (0.3), local production 108 (0.7).

India and Burma:—Exports from India during January were 18,000 tons as compared with 114,000 tons in 1937, a decrease of 84.2 per cent. Of these, nil (2.6) per cent. were to the United Kingdom, nil (2.6) per cent. to the Continent of Europe, 50.0 (47.4) per cent. to Ceylon, 5.6 (30.7) per cent. to the Straits Settlements and the Far East, and 44.4 (16.7) per cent. to other countries. The figures in brackets are for 1937.

According to the *Indian Trade Journal,* 3rd March, 1938, in the final rice forecast of All-India for the season 1937-38 the area and yield are estimated at 71,992,000 acres and 26,544,000 tons, shewing a decrease of 527,000 acres (or 0.7 per cent.) in area and 1,340,000 tons (or 4.8 per cent.) in yield as compared with the corresponding crop in the previous season.

Burma's foreign exports from 1st January to 23rd February were 420,173 tons as compared with 491,232 tons in 1937, a decrease of 14.5 per cent.

Of these exports 50.9 (50.6) per cent. were to India, 10.1 (10.3) per cent. to the United Kingdom, 1.2 (2.3) per cent. to the Continent of Europe, 17.0 (14.6) per cent. to Ceylon, 15.9 (15.4) per cent. to the Straits Settlements and the Far East, and 4.9 (6.8) per cent. to other countries. The percentages in brackets are in respect of 1937.

Siam.—Exports of rice and rice products from Bangkok during December were 92,776 tons; the total exports for the year 1937 were 943,224 tons as compared with 1,583,165 tons in 1936.

Japan.—According to a communication dated 9th February 1938, received from the British Embassy in Tokyo, the actual rice crop of Japan for the year 1937

* Abridged from the Rice Summary for February 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936 or 1937.

was 9,301,505 tons, a decrease of 143,053 tons or 1.5 per cent. as compared with the actual crop for 1936.

The actual rice crop of Korea for 1937 is placed at 3,758,338 tons, an increase of 1,035,931 tons or 38.1 per cent. over 1936.

The yield of the second rice crop of Formosa for the year 1937 is estimated at 676,231 tons, a decrease of 26,828 tons or 3.8 per cent. as compared with 1936.

French Indo-China.—Entries of padi into Cholon during January and February totalled 254,367 tons as compared with 268,131 tons in 1937, a decrease of 5.1 per cent. Exports of rice were 244,175 tons as compared with 200,619 tons in 1937,an increase of 21.7 per cent.

The Netherlands Indies.—The latest information available was published in the October Summary.

Ceylon:—Imports of rice during January and February totalled 88,249 tons as compared with 100,543 tons in 1937, a decrease of 12.2 per cent. Of these imports 13.8 (8.8) per cent. were from British India, 76.1 (64.3) per cent. from Burma, 1.1 (nil) per cent. from the Straits Settlements, and 9.0 (26.9) per cent. from other countries. The percentages in brackets are the corresponding figures for 1937.

Europe and America.—Shipments to Europe from the East from the 1st January to 4th February were 13,567 tons as compared with 16,044 tons in 1937, a decrease of 15.4 per cent. Of these shipments 8.9 (33.7) per cent. were from Burma, 52.1 (nil) per cent. from Saigon, 36.0 (49.8) per cent. from Siam, and 3.0 (16.5) per cent. from Bengal. The figures in brackets are the corresponding percentages for 1937.

Shipments for the Levant from the 1st to 15th January were 482 tons as compared with 124 tons in 1937. Shipments for Cuba, West Indies and America from 1st to 31st January were 9,532 tons as compared with 5,230 tons in 1937.

MALAYAN AGRICULTURAL EXPORTS, FEBRUARY, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Feb. 1937	Jan./Feb. 1938	February 1937	February 1938
Arecanuts ...	30,084	5,326	6,881	1,239	3,797
Coconuts fresh † ...	95,223†	11,441†	12,011†	6.502†	6.968†
Coconut oil ...	39,762	5,964	6,892	3,385	3,834
Copra ...	75,592	8,035	6,737	3,760	1,047
Gambier, all kinds ...	1,955	338	245	212	64
Copra cake ...	15,026§	2.284§	683	1,187§	30
Palm kernels ...	7,312	1.031	1,171	437	475
Palm oil ...	42,787	5,562	7,259	3,740	2,765
Pineapples canned ...	80,502	12,290	11,444	5,974	5,813
Rubber ¶ ...	503,127¶	74,668	72,483¶	34,759¶	32,459¶
Sago,—flour ...	15,478	3,031	506	1,219	467
,, —pearl ...	3,759	631	634	317	244
,, —raw ...	8,256*	1,179*	1,155*	588*	656*
Tapioca,—flake ...	1,058	231	192	88	91
,, —flour ...	2,393*	434*	606*	411*	359*
,, —pearl ...	18,786	2,644	2,146	769	885
Tuba root ...	573	140	53	46	28

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
Total ...	4,282.1	2,766.3	754.1	493.0
Total Jan. and Feb., 1937 ...	3,744.4	2,716.8	684.0	464.7
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 28th February, 1938 were: palm oil 3,789 tons, palm kernels 678 tons.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 28th February, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber not Tapped: Estates which have entirely ceased tapping — Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems — Acreage	Percentage of (7) to (2)	Under rotational systems — Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped — Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,580	24,622	56.5	375	0.8	9,753	22.4	8,830	20.3	438	1.0	18,958	43.5
Malacca ...	122,313	76,101	62.2	1,755	1.4	12,935	10.6	31,522	25.8	2,069	1.7	46,212	37.8
Penang ...	2,487	1,606	64.6	—	—	821	33.0	60	2.4	72	2.9	881	35.4
Singapore ...	32,743	20,417	62.4	1,978	6.0	5,816	17.8	4,532	13.8	190	0.6	12,326	37.6
Total S.S. ...	201,123	122,746	61.0	4,108	2.0	29,325	14.6	44,944	22.4	2,769	1.4	78,377	39.0
F. M. S.—													
Perak ...	289,053	194,393	67.3	1,051	0.3	36,967	12.8	50,642	19.6	7,278	2.5	94,660	32.7
Selangor ...	329,697	238,722	72.4	1,687	0.5	28,649	8.7	60,639	18.4	6,871	2.1	90,975	27.6
Negri Sembilan ...	256,436	174,824	68.2	3,607	1.4	27,663	10.8	50,342	19.6	8,004	3.1	81,612	31.8
Pahang ...	85,959	57,709	67.1	1,507	1.8	17,354	20.2	9,389	10.9	7,717	9.0	28,250	32.9
Total F.M.S. ...	961,145	665,648	69.3	7,852	0.8	110,633	11.5	177,012	18.4	29,870	3.1	295,497	30.7
U. M. S.—													
Johore ...	476,107	340,512	71.5	3,900	0.8	60,947	12.8	70,748	14.9	34,296	7.2	135,595	28.5
Kedah ...	198,175	145,068	73.2	3,595	1.8	13,039	6.6	36,473	18.4	5,899	3.0	53,107	26.8
Kelantan ...	31,304	21,953	70.1	243	0.8	5,320	17.0	3,788	12.1	2,514	8.0	9,351	29.9
Trengganu (b) ...	4,817	3,178	66.0	—	—	74	1.5	1,565	32.5	74	1.5	1,639	34.0
Perlis (c) ...	1,347	800	59.4	—	—	94	7.0	453	33.6	94	7.0	547	40.6
Brunei ...	4,979	3,353	67.4	—	—	713	14.3	913	18.3	974	19.6	1,626	32.6
Total U.M.S. ...	716,729	514,864	71.8	7,738	1.1	80,187	11.2	113,940	15.9	43,851	6.1	201,865	28.2
Total Malaya ...	1,878,997	1,303,258	69.4	19,698	1.0	220,145	11.7	335,896	17.9	76,490	4.1	575,739	30.6

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF FEBRUARY, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. and Feb 1938	during the month	Jan. and Feb. 1938	during the month: Foreign	during the month: From Malay States & Labuan	January and Feb. 1938: Foreign	January and Feb. 1938: From Malay States & Labuan	during the month: Foreign	during the month: Local	January and Feb. 1938: Foreign	January and Feb. 1938: Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. and Feb. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	11,892	14,808	11,786	26,018	4,455	11,609	Nil	Nil	Nil	Nil	13,411	3,758	26,398	8,586	...	10,733	15,026	13	31
Johore ...	...	3,547	5,403	5,655	11,702	2,447	5,644	Nil	30	Nil	61	3,858	4,231	6,326	11,722	...	3,208	5,785	...	...
Kedah ...	...	458	3,910	2.900	6,654	831	2,159	Nil	Nil	Nil	Nil	1.759	1,979	4,203	4,378	...	377	3,984	...	...
Perlis ...	...	14	22	12	29	20	51	Nil	Nil	Nil	Nil	Nil	31	Nil	68	..	13	24	...	...
Kelantan ...	...	751	295	401	778	792	1,203	Nil	Nil	Nil	Nil	192	952	404	1,568	...	744	351	...	...
Trengganu ...	...	55	50	213	510	107	255	Nil	Nil	Nil	Nil	Nil	320	Nil	765	...	55	50	...	...
Brunei ...	...	18	78	60	116	76	131	...	...	...	...	...	143	...	233	...	18	71	...	...
Total Malay States	...	16,735	24,566	21,027	45,807	8,728	21,052	Nil	30	Nil	61	19,920	11,414	37,331	27 320	...	15,148	25,291	13	31
S. SETTLEMENTS :—																				
Malacca ...	...	2,693	1,410	1,148	2,657	523	907	Nil		Nil		2,703		4,486		...	2,465	1,299	...	...
Province Wellesley	..	3,035	892	430	1,014	267	418	Nil		Nil		8,644		19,137		...	2,641	822	...	...
Penang ...	2,306	6,297	15	21	47	72	133	2,288	12 973	5.130	28,673		Nil		Nil	2,215	6,182	10	...	...
Singapore ...	6,386	33,525	256	168	347	58	82	9,555		23,710		18,332		35,931		6,604	31,259	268	22	47
Labuan ...	...	40	Nil	Nil	Nil	17	19	31		112		Nil		Nil		...	46	Nil	...	...
Total Straits Settlements ...	8,692	45,590	2,574	1,767	4,065	937	1,559	11,874	12,973	28,952	28,673	29,679	Nil	59,554	Nil	8,819	42,593	2,399	22	47
Total Malaya ...	8,692	62,325	27,140	22,794	49,872	9,665	22,611	11,874	13,003	28,952	28,734	48,899	11,414	96 885	27,320	8,819	57,741	27,690	35	78

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	9.775	30.130	5.883	4.828	2.548	209
WET RUBBER	958	1.129	299	342	660	168
TOTAL ...	10 733	31.259	6.182	5.170	3.208	377

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan & Feb. 1938
29	30	31
Singapore ...	32.184	61.762
Penang ...	12,007	26,781
Port Swettenham.	4.481	8,025
Malacca ...	227	317
MALAYA ...	48.899	96,885

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan.&Feb' 1938
32	33	34
Malay States ...	30,561	64.457
Straits Settlements	2,901	5.707
MALAYA ...	33,462	70,164

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e., Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) − (2) − (3) − (4) − (5) − (9) − (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 24th March, 1938

METEOROLOGICAL SUMMARY, MALAYA, FEBRUARY, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.2	71.9	82.1	95	69	87	74	84.6	85.0	6.06	153.9	1.58	12	11	2	2		219.45	7.84	65
Bukit Jeram, Selangor ...	89.9	72.7	81.3	93	71	85	74	86.2	86.7	2.17	55.1	0.88	10	7				240.00	8.57	71
Sitiawan, Perak ...	90.0	72.7	81.3	93	69	87	75	84.1	84.4	4.65	118.1	1.58	9	6	5			237.75	8.49	71
Ipoh Aerodrome, Perak ...	92.5	71 2	81.9	96	68	88	74	83.7	84.3	5.11	129.8	1.25	13	9	5		1	225.90	8.07	68
Temerloh, Pahang ...	90.1	72.3	81.2	95	68	84	75	86.0	85.3	0.90	22.9	0.76	6	2		2		198.85	7.10	59
Kuala Lipis, Pahang ...	89.4	71.0	80.2	94	69	84	74	83.9	84.0	3.71	94.2	1.29	12	7	1	10		191.30	6.83	57
Kuala Pahang, Pahang ...	85.3	76.3	80.8	89	73	81	80	84.8	84.7	8.82	224.0	3.98	11	7			1	210.30	7.51	63
Kallang Aerodrome, S'pore ...	88.3	75.1	81.7	94	72	80	77	82.3	82.9	4.72	119.9	1.28	13	11	2			199.60	7.13	59
Bayan Lepas Aerodrome Penang ...	88.7	73.5	81.1	91	69	86	76	84.1	84.2	2.84	72.1	1.13	10	8	2			234.50	8.37	70
Bukit China, Malacca ...	89.7	74.5	82.1	95	72	85	77	85.0	84.4	0.67	17.0	0.41	3	2			1	235.50	8.41	69
Kluang, Johore ...	90.1	72.4	81.3	95	68	82	74	81.7	81.6	5.02	127.5	1.99	12	11	2	4		204.60	7.31	60
Bukit Lalang, Mersing, Johore	84.1	73.7	78.9	86	70	81	78	81.3	80.4	3.62	91.9	1.39	10	9		1	2	220.75	7.88	65
Alor Star, Kedah ...	90.9	72.2	81.5	93	69	86	75	84.1	85.0	2.09	53.1	0.89	8	6	1	3		225.70	8.06	68
Kota Bahru, Kelantan ...	87.0	72.3	79.7	91	67	85	76	82.7	83.1	2.74	69.6	0.86	10	7				228.80	8.17	69
Kuala Trengganu, Trengganu	85.5	73.2	79.3	88	70	83	77	82.2	82.7	4.58	116.3	1.16	10	7		3		215.65	7.70	64
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	73.1	62.1	67.6	79	60	66	65	71.1	71.1	6.21	157.7	1.83	12	9	1	16		177.95	6.35	53
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.5	53.8	63.7	76	43	69	61	69.8	70.1	5.91	150.1	1.81	12	11				174.40	6.23	52
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.8	58.4	66.1	78	56	68•	61			6.22	158.0	1.66	11	11				184.30	6.58	55

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

MAY, 1938.

EDITORIAL.

Agricultural Education in Malaya.

The account, which appears on another page of this issue, of the annual prize distribution at the School of Agriculture, Malaya, serves to draw attention to the important subject of agricultural education in Malaya.

In the minds of the public, agricultural education in this country implies the training of Asiatics for salaried posts in the Department of Agriculture and the Rubber Research Institute; the fitting of Asiatics for more responsible posts on estates; the encouragement of peasant agriculture; and the training of young schoolboys without necessarily expecting it to bear a direct or immediate application in agricultural practice.

These and other aspects of the subject indicate the objectives of a comprehensive policy. They are not all attainable, nor is it desirable that they should be be attainable, at any one institution. There are, in fact, various organizations in the country, each of which is concerned with its own aspect or aspects of the subject and, in order that real advances may be made in local agricultural practice, it is essential that such organizations should be carefully planned and conducted and that there should be close collaboration between them.

While we cannot look back and review its progress over a long period of years, agricultural education in Malaya is nevertheless no mushroom growth, and the present occasion is perhaps an opportune one on which to consider the position, trace past progress and visualize the future.

Early efforts in our agricultural education followed two unrelated channels. In one, the Department of Agriculture found it necessary to instruct probationary Asiatic officers to fit them for junior appointments. Probationers were until 1924 attached to senior research or field officers for this training, but in that year a considerable advance was made by centralizing instruction under a single European teacher at headquarters, thus bringing into being a school which was to prove the forerunner and nucleus of the present institution at Serdang. Following the second channel, the Education Department realized that a measure of agricultural training in the form of school gardening was a useful means of developing the body, training the mind and imparting to it an agricultural bias appropriate to the education of an essentially agricultural community. A start was therefore made at the Matang

College in Perak and in selected localities by establishing school gardens. This was later amplified in collaboration with the Department of Agriculture and was in due course firmly established by the inclusion of this subject in the curriculum of the Sultan Idris Training College whence come all teachers in Malay vernacular schools, a policy which has led to a very considerable increase in the number of school gardens throughout the Peninsula.

The success of the new policy of training the junior staff of the Department of Agriculture soon attracted attention and led to a revival of the demand for an institution which should be open to the public as well as to potential departmental officers and which would provide a higher standard of agricultural training and knowledge throughout the country. In spite of the financial difficulties of the time, proposals for a School of Agriculture at Serdang were approved by Government and the School was duly opened in 1931.

More recent developments include the opening of two Farm Schools, one in Malacca and one in Penang, which offer a year's course of essentially practical training designed to meet local rather than pan-Malayan requirements. It is possibly too early to judge their success but they are organized on elastic lines which should ensure their adaptability to any changes which may be indicated by experience and they should in due course exert a profound influence on the agriculture of the localities in which they are situated.

This brief résumé of the development of agricultural education in Malaya will assist in an appreciation of the present position. The centre of such education must necessarily lie in the Department of Agriculture itself and particularly in those divisions which are responsible for agricultural research. The School of Agriculture then becomes one of the most important links in the chain which carries a knowledge of this research to the Asiatic planter, other links being the Farm Schools together with such other activities as Demonstration Stations, the Rural Lecture Caravan, the work of the Asiatic Rubber Instructors, departmental publications in English and the vernacular, and even school gardens—although the principal function of the last-named may possibly still continue to lie in imparting an agricultural bias to elementary vernacular education rather than in attempting the more intensive and applied training associated with a purely agricultural institution.

It is evident that on the maintenance of a high standard at the School of Agriculture will largely depend the progress that can ultimately be attained in the general improvement of Malayan agriculture. The standard at which the School aims is not purely academic but takes into consideration such important factors as the physique and personality of its students in that many of these factors are destined to direct not only their training but also their personal influence towards the advancement of agriculture. Care is therefore essential not only in formulating the syllabus of work but also in the selection of its students. The School's function is clearly set forth in the prospectus but may be repeated here: "The function of the School is to provide agricultural education suited to the diverse needs of private agriculturists in Malaya and neighbouring territories and, in a minor degree, of recruits for junior appointments in local government agricultural services."

Up to the present time, 247 students and pupils have completed their training at the School, of whom 153 are known to have obtained employment in one capacity or another, while nearly 20 more are assured posts in the immediate future. Most of them have been absorbed by the Department of Agriculture and the Rubber Research Institute in the building up of their cadre of Asiatic officers. Actual employment figures are probably higher in that nothing is known of some 20 old boys who have failed to keep in touch with the School. These figures are sure proof of the practical utility of the instruction that is given.

Existing policy in relation to agricultural education has been designed to reach all classes of the community in Malaya. Its influence will be more widely and definitely realized as times goes on, especially if (as is believed to be the case) the small band of trained men from the School prove their value in the various positions they have obtained. Employers can do much to assist this progress by recruiting from the School as far as possible, but more far-reaching results may possibly be expected from the fact that Asiatic estate-owners are sending their sons for training in preparation for assuming greater responsibility in the management of the family property. While one may confidently regard this system of agricultural education as being well organized and conducted, the success of Government's efforts will depend in no small measure on the close and sympathetic co-operation of those members of the public who are in a position to make use of the facilities which are now available.

Original Articles.

GARCINIA ATROVIRIDIS OR ASAM GELUGOR

BY

J. N. MILSUM,

State Agricultural Officer, Perak.

Introductory.

It is, perhaps, not generally known that the unripe fruit of *Garcinia atroviridis*, when sliced and dried, forms a sour relish which is extensively sold throughout Malaya for use in curries. In parts of Perak the tree commonly occurs in Malay settlements and, when in season, the sliced fruit is often seen undergoing sun-drying on bamboo slats by the roadside. The Malay name for the tree is 'asam gelugor' and the collection, slicing and drying of its fruit form a small local industry. Certain allied fruits are used for the same purpose in other countries. The tree grows well under local conditions where it is found associated with fruit trees such as the mangosteen, (*Garcinia Mangostana*); durian, (*Durio zibethinus*); and champedak, (*Artocarpus champeden*).

There are numerous Garcinias in Malaya, several of which are edible, but our knowledge regarding them is incomplete. It is proposed in this article to give a brief description of *Garcinia atroviridis* together with an account of the preparation of 'asam gelugor' as practised in north Perak.

Description.

The tree is a handsome one, 20 to 60 feet high or more, and is stated by Ridley (1) to occur wild in forests at 1,500 feet altitude throughout Malaya. Many semi-cultivated specimens seen have a characteristic pyramidal shape with pendulous branches (Plate 1). When mature it requires a planting distance of at least 30 feet. It appears to be slow-growing and probably does not bear fruit until eight years old or more.

The leaves are opposite, long and narrow (often 8 in. by 2 in.), red when young, turning deep green. The surface is leathery with numerous thin inarching nerves. The petioles are dull-red, about 1 in. long.

The flowers are unisexual *i.e.* male and female flowers are produced on separate trees, as with other species of the genus Garcinia. The male inflorescence is disposed in terminal or axillary clusters containing up to sixteen flowers. The male flowers are 1 in. or more across with four fleshy sepals and four petals arranged in pairs alternately at right angles, the latter being bright crimson. The stamens are united in whorls on a fleshy receptacle surrounding a rudimentary pistil. The female flowers are usually terminal and produced singly, but a pair of lateral flowers may surmount the former. Sepals and petals are similar to those of the male flowers but the petals are somewhat smaller. The ovary is green, cylindrical, with a ribbed

PLATE I.

Garcinia atroviridis. Young tree showing pyramidal shape.

PLATE II.

Fruit preparatory to slicing, with drying slats under cover behind.

surface, at the base of which is a ring of abortive stamens. A large deep-red cap-shaped stigma crowns the ovary.

Immediately upon the ovary becoming fertilized it enlarges rapidly, the stigma shrinks and hardens, and the perianth loses most of its red colour. Apparently almost all the female flowers set fruits which is rather remarkable in view of the fact that considerable distances often separate the female and male trees. In the case of the mangosteen parthenogeny is suspected owing to the absence of records of male flowers occurring in Malaya. There is, however, no experimental proof of this.

The fruit is large, three to four inches in diameter, with a flattened apex and fluted surface, as is indicated by the name 'gelugor' (Malay: fluting, striation) (Plate II). When fully ripe it is brilliant orange-yellow in colour. It has an acid juicy fruit-wall which surrounds the solitary ovules, twelve to sixteen in number, attached to the placenta.

The seeds are small, about half an inch long, flattened, with a pulpy aril, and destitute of albumen. From the small number of observations made it appears that six to eight seeds are usually contained in each fruit. Upon maturing, and after the fruit has fallen from the tree, the fluted sections separate from the placenta and fall apart.

Self-sown seedlings are sometimes found growing near the female trees and so far as is known there is no other method of propagation practised other than from seed. It would be a considerable advantage should it be found possible to propagate trees vegetatively since this would ensure female trees being planted. As it is at present, male trees are allowed to continue to grow, the Malay owners failing to appreciate the fact that such trees are at all times unfruitful.

In a good season, a mature tree will produce several hundred fruits. The main season is stated to be from February to June, but fruiting occurs throughout the year.

Both fruit and leaves are used medicinally, and the juice is mentioned as a fixative for dyes (2). The fruit is also used for preserves, but its most important use is in the preparation of a substitute for tamarind in curries.

Preparation of Asam Gelugor.

At Changkat Jering in the Larut District of Perak, a village industry has been in existence for many years. This is the centre of the local industry but sliced fruit may be seen drying by the roadside at many places between Taiping and Kuala Kangsar.

Malay land-owners lease their trees, mainly to Chinese, at varying prices according to the size and reputation of the individual tree and crop expected. There are usually one or two trees in each holding, often thirty to forty years old. Young trees are only occasionally met with and there is no attempt at organized planting as with the rambutan. Prices range from 50 cents to $5 (Straits currency) per tree per annum. The sum agreed upon is paid in advance to the growers and in some cases a written agreement with the respective owners is retained by the lessee. The

lessee pays for fruit collection and arranges transport to centres for preparation; Malays usually do this work. They set out early in the morning and collect about a picul (133 lbs.) of fresh fruit by noon which is a sufficiently heavy load to transport by bicycle. The fruit arrives during the afternoon and is immediately sliced. The majority of the fruit is gathered green and under-ripe and is either hand-picked from the tree or secured by means of long bamboos. Immature fruit is more acid in flavour than ripe fruit.

The fruits are sliced singly by hand, by an operator sitting astride a long board provided with a sharp cutting knife slotted in at one end (Plate III). The knife is about 8 in. long and 4 in. wide, fitted with two prongs which are fastened down to the board with wooden wedges. By this means slices of equal thickness are obtained. A narrow slot in front of the cutting edge allows the slices to fall into a basket below the board. The slice is usually $\frac{1}{8}$ in. thick, but this depends upon ruling prices and weather conditions, the thinnest slices being prepared during the wet weather. The cutting instrument is imported from China where it is commonly used for slicing sweet potato tubers, and is known in Malaya as 'tagat asam.'

Immediately after cutting, the slices are placed in a single layer on bamboo slats, about 8 feet long and 3 feet wide, which is a convenient size for lifting. The slats are placed in an open space, often the roadside, exposed to the sun (Plate IV). During the night and in rainy weather the slats are stored under shelter. Drying takes from two to five days according to weather conditions. The size and weight of fruit varies considerably. About 200 good sized fruits weigh 1 picul (=133 lbs.). The percentage of prepared product to fresh fruit naturally depends upon the extent to which the slices are dried, but approximates to 17 per cent.

The writer is indebted to the Senior Chemist, S.S. and F.M.S., for moisture determinations. The moisture content of fresh slices of fruit was 86 per cent. and that of a sample of the prepared product 19 per cent. The loss on drying, calculated on the weight of the fresh slices of fruit, amounts to approximately 82.3 per cent.

The Chinese who prepare 'asam gelugor' sell their produce wholesale to distributors in the towns. Wholesale prices fluctuate considerably according to the amount of fruit available. At the time of writing (March, 1938) it is from $14 to $15 per picul; this price, however, falls as fruit becomes more plentiful. The retail price at present is about 20 cents per kati (=1.3 lb.).

Local 'asam gelugor' is despatched to Kedah, Penang, Kelantan and Trengganu. The commodity apparently does not deteriorate readily and is often stored for several months before sale. This seems remarkable in view of the high moisture content of the prepared product.

Use.

The 'asam gelugor' is washed in cold water before use. A few pieces are then placed in the receptacle containing the curry ingredients. The addition of 'asam gelugor' gives a characteristic relish to the curry, which is much liked by Malays and Chinese, especially by the former. Usually a handful or so, costing one or two cents, is purchased as often as required. It is estimated that a Malay family may

PLATE III.

Fruit being sliced and placed on slats for sun-drying.

PLATE IV.

Slices drying on slats by the roadside.

Plate V.

Garcinia atroviridis.—1, Female flower. 2, Female flower in section. 3, Male flower. 4, Male flower in section. 5, Fruit. 6, Fruit, showing fluted sections with seeds surrounding the placents. 7, Seed with aril removed. (all reduced).

use ½ to 1 kati per month. Indians do not require it as they use almost solely the preserved acid pulp of the tamarind tree (*Tamarindus indica*), known locally as 'asam jawa,' large quantities of which are imported into this country from India. 'Asam jawa' is also used to some extent by Malays. A further use for 'asam gelugor' is for dressing fish.

Conclusions.

The industry in the Larut District of Perak appears to be tolerably well organized and several Chinese who prepare the product have been in the business for many years. It is difficult to estimate the extent of the trade in Malaya since it is almost entirely an internal one. A keen demand for fresh fruit, however, exists, and there is no over-production.

The great majority of the trees seen are old, and little replanting appears to have been undertaken since the Para rubber tree made its appearance in the 'kampong' some thirty years ago. Extended planting in new areas appears to be worth encouraging since it is a village industry well-suited to the Malay land-owner. Investigations regarding possible variations in quality of fruit and improved methods of propagation and cultivation should give useful results. Further, since *Garcinia atroviridis* is unisexual much waste of space would be eliminated by planting female trees should vegetative propagation be proved possible.

Acknowledgment.

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MALAYAN AGRICULTURAL TRADE IN 1937

BY

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Prices.

There was a welcome improvement in market prices of practically all the agricultural products of Malaya in 1937. Prices were sharply on the up-grade during the latter part of 1936, and continued to improve during the first half of 1937. During the last six months of 1937, however, there was a retrograde movement and the year ended with prospects far less encouraging than they were earlier in the year.

It will be remembered that prices were satisfactory in 1928, but from the following year they fell steadily, reaching their lowest values in 1933 and 1934. In the past three years they have shewn a steady improvement, and it may be said that prices in 1937 were comparable with those ruling in 1930. This applies to all the main export crops with the exception of pepper, the market for which was affected by market manipulations a few years back, and pineapples, the prices of which have been depressed by considerably increased production which appears to call for improved marketing methods.

Table I shews the average Singapore prices for the past few years.

As in previous reviews of Malayan agricultural trade, the subject will be treated in this place under three heads—the production of crops for internal consumption, agricultural products for export, and the preparation for market of products from neighbouring countries. The crops included in this review are those grown in Malaya and also crops which at least theoretically, although perhaps not economically, might be grown in this country.

Local Agricultural Products.

Chief amongst the crops grown for local consumption is rice; in addition there are coconut products, vegetables, fruits, coffee, tea, tobacco, and a number of minor crops. Statistical information of the production and local consumption of rice and tea is reasonably accurate, but for the other crops in this category in addition to such crops as arecanuts, cultivated for local consumption and foreign export, this information is not available.

The production of rice in Malaya in the 1936-37 season amounted to 319,234 tons from an area of 740,040 acres. These figures are well up to average and indicate that the policy of the local Governments in fostering padi production by such means as improved irrigation and selected seed is successful in maintaining production of this staple food product.

Local production supplies only 36 per cent. of Malaya's rice requirements, net imports amounting to 573,063 tons. Total consumption of rice was 892,297 tons, which, on the basis of present yields of padi in Malaya, would require an

Table I.

Average Annual Market Prices in Singapore of Agricultural Products.

Year	Rubber per lb.	Copra per picul	Coconut Oil per picul	Palm Oil per ton	Palm Kernels per ton	Gambier per picul	Sago per picul	Tapioca per picul	Nutmegs per picul	Pepper per picul	Arecanuts per picul	Pineapples per case
	cents	$	$	£ s. d.	£ s. d.	$	$	$	$	$	$	$
1929	34.63	9.45	16.69	28 6 3	18 4 3	14.69	7.98	6.27	46.60	57.31	9.10	
1930	19.15	7.81	14.35	23 7 2	13 5 5	15.30	6.56	4.73	31.03	33.56	8.95	
1931	9.82	5.09	9.69	18 18 3	10 7 7	17.39	5.01	3.59	23.02	20.39	6.75	
1932	6.97	5.74	10.04	17 18 9	11 1 3	14.83	4.25	3.23	24.78	20.44	5.62	3.34
1933	10.21	3.90	7.70	16 0 3	8 16 4	7.70	4.17	4.35	20.50	14.49	6.50	3.11
1934	20.63	2.94	5.96	12 9 3	6 12 8	7.76	3.92	4.13	23.41	16.33	6.50	3.10
1935	20.35	4.54	9.13	19 19 8	8 13 9	10.53	3.86	4.38	29.40	12.37	6.74	3.47
1936	27.04	5.81	11.96	19 18 2	11 0 11	10.30	4.10	5.50	29.62	8.36	6.83	3.29
1937	32.09	6.45	11.13	22 3 4	12 14 5	15.71	5.24	5.15	34.77	9.91	7.71	3.02

additional area of 1,332,000 acres, if Malaya is to become independent of foreign imports.

The value of Malayan production of rice in 1937, based on the average wholesale price of Rangoon rice in Singapore, was $20,100,000 or $350,000 greater than in 1936.

From a rough estimate of local consumption of Malayan production of such crops as coconuts, vegetables and fruits, it is probable that Malaya now produces fully 50 per cent. of her food requirements.

Export Crops.

The principal export crops are rubber, coconut products, pineapples, oil palm products and arecanuts. Amongst other export crops are tapioca, sago, gambier, derris root, and spices.

Rubber.—Exports were subject to control under the International Rubber Regulation Scheme. Net exports were 468,189 tons valued at $341,183,175, as compared with 352,343 tons, valued at $208,481,052 in 1936. The improvement of the rubber market has contributed materially to the well-being of the community, and this is particularly felt by the Asiatic small-holder whose means at the best of times are slender so that the margin between prosperity and poverty is narrow.

Coconut Products.—The net exports of coconut products shewed a decline over the past two years, possibly due to the less favourable season coupled with increased local consumption resulting from the general improvement of prices of other export products. Net copra exports at 75,592 tons were 1,000 tons less than in 1936; the value of these exports, however, improved by 1 million dollars to $9,207,000. Coconut oil net exports decreased by nearly 7,000 tons, although the total value of 1937 exports was approximately the same as in the previous year. In addition to the foregoing, fresh coconuts and coconut cake are exported in considerable quantities. In 1937, the copra equivalent of total net coconut products exported amounted to 142,110 tons or about 12,400 tons less than 1936. The value of these exports was $17,761,000 or nearly 1 million dollars in excess of 1936 values, and the highest figure reached since 1930.

Pineapples.—Owing to increased acreage under this crop, much of which is now planted as a sole crop instead of as a catch crop with rubber as was formerly the case, the production of canned pineapples increased and exports rose by 4,000 tons to a total of 80,504 tons in 1937, in addition to which it is stated that a considerable stock of canned pineapples is held in the country. The value of exports amounted to $8,825,551. Exports constituted a record and it is expected that this figure will be exceeded in 1938.

It will be seen that canned pineapples were one of the very few agricultural products which did not share in the general upward trend of prices. This is probably due to increased competition in the United Kingdom with other canned fruits and to defects in marketing methods.

Oil Palm Products.—The Malayan oil palm industry continued to expand, due to an increased area coming into production and the numerous areas where the

palms were reaching the age of full productivity. Net exports of oil amounted to 42,787 tons valued at $6,492,862, and of kernels 7,312 tons valued at $626,967. Production of oil increased by 13,773 tons and kernels by 2,774 tons over 1936, while the total value of net exports in 1937 at $7,119,829 was $2,825,720 in excess of 1936.

Arecanuts.—Net exports at 30,084 tons shewed an increase over 1936 of 3,536 tons, while the value of exports in the year under review at $4,333,519 shewed an improvement of $1,096,148 over 1936.

The remainder of the export crops call for little comment: tapioca net exports increased slightly, while sago increased from 2,012 tons in 1936 to 10,981 tons in 1937. Gambier exports declined still further, though values improved slightly. The derris market shewed no expansion and values no improvement.

Table II.

Imports and Exports of certain Agricultural Products 1937.

Product.	Imports		Exports.		Net Exports	
	Tons	Value $	Tons	Value $	Tons	Value $
Rubber ...	213,449	143,478,636	681,638	484,661,811	468,189	341,183,175
Coconut Products ...	126,143	13,751,261	263,325	31,512,586	137,182	17,761,325
Pineapples ...	2	905	80,504	8,825,551	80,502	8,824,646
Oil Palm Products ...	140	26,204	50,239	7,146,033	50,099	7,119,829
Arecanuts ...	53,071	6,243,993	83,155	10,577,512	30,084	4,333,519
Tapioca ...	6,761	532,507	24,212	1,983,751	17,451	1,451,244
Sago ...	63,379	3,345,813	74,360	4,917,308	10,981	1,571,495
Gambier ...	2,161	350,235	4,116	892,551	1,955	542,316
Derris Root ...	52	17,942	625	401,914	573	383,972
Pepper ...	9,887	2,420,966	10,712	2,892,636	825	471,670

Table II shews the trade in the chief products and also exhibits the value of the entrepôt trade, especially in rubber, coconut products, arecanuts, sago and pepper. Much of this trade is concerned in the conditioning of the products to render them suitable for the world's markets.

The gross agricultural trade of Malaya in 1937 amounted to 3,249,000 tons valued at $875,000,000 as compared with 2,998,000 tons, valued at $609,000,000 in 1936 and 2,958,000 tons, valued at $533,000,000 in 1935.

Table III.

Annual Net Imports and Exports of Agricultural Products, Malaya.

Year.	Net Imports*		Net Exports† (excluding rubber)		Excess of Imports over Exports (excluding rubber)		Net Exports of Rubber		Excess of Total Imports over Exports	Excess Value of Exports over Value of Imports
	Quantity. Tons	Value $	Quantity. Tons	Value $	Quantity. Tons	Value $	Quantity. Tons	Value $	Quantity. Tons	Value $
1923	643,000	101,600,000	206,600	43,100,000	436,400	58,500,000	181,700	227,200,000	254,700	168,700,000
1924	694,600	118,400,000	219,000	51,600,000	475,600	66,800,000	152,500	189,900,000	323,100	123,100,000
1925	744,800	133,100,000	218,700	48,600,000	526,100	84,500,000	161,800	519,000,000	364,300	434,500,000
1926	857,300	157,400,000	225,800	50,000,000	631,500	107,400,000	243,400	547,500,000	388,100	440,100,000
1927	956,000	167,400,000	207,500	42,700,000	748,500	124,700,000	190,700	351,400,000	557,800	226,700,000
1928	921,400	158,900,000	230,700	44,900,000	690,700	114,000,000	260,100	262,900,000	430,600	148,900,000
1929	1,004,500	171,700,000	254,700	44,000,000	749,800	127,700,000	418,000	353,700,000	331,800	226,000,000
1930	1,022,300	150,800,000	244,100	37,800,000	778,200	113,000,000	421,000	199,600,000	357,200	86,600,000
1931	883,200	92,100,000	241,200	26,700,000	642,000	65,400,000	393,600	99,300,000	248,400	33,900,000
1932	737,800	74,200,000	253,500	29,000,000	484,300	45,200,000	386,000	68,100,000	98,300	22,900,000
1933	770,000	66,700,000	265,700	25,600,000	504,300	41,100,000	445,700	101,400,000	58,600	60,300,000
1934	871,200	78,700,000	272,800	23,400,000	598,400	55,300,000	465,800	207,900,000	132,600	152,600,000
1935	885,100	81,100,000	314,500	40,000,000	750,600	41,100,000	415,700	191,100,000	154,900	150,000,000
1936	991,900	87,100,000	311,400	36,700,000	680,500	50,400,000	352,300	208,500,000	328,200	158,100,000
1937	1,081,200	103,200,000	328,500	42,500,000	752,700	60,700,000	468,200	341,200,000	284,500	280,500,000

* Imports include coir cordage and fibre, mats and matting, padi and rice, coffee, tea, kapok, mace and nutmegs, pepper, ginger, groundnuts and groundnut oil, sugar, tobacco, vegetables, livestock for food, meat, leather goods, milk, butter, poultry and eggs, feeding stuffs for animals, ataps, cloves, castor oil, gingelly seed and oil, fruits, citronella oil and flowers.

† Exports include rubber seed, coconut products, palm oil and kernels, canned pineapples, arecanuts, sago, tapioca, derris root, hides and skins, gambier, patchouli leaves and oil, mace and nutmegs, pepper and gambier.

To summarize, net exports of agricultural products other than rubber shewed an increase of 5 per cent. over 1936, being 328,503 tons, the highest figure on record. Net export values were $42,470,051, an increase of 15.6 per cent. over 1936 and the highest figure since 1929.

Adding net exports of rubber, the figures become:—

1935	730,127	tons valued at	...	$231,176,882
1936	663,701	,, ,, ,,	...	$245,218,982
1937	796,692	,, ,, ,,	...	$383,653,226

The Value of Agricultural Trade.

The actual value to Malaya of her agricultural trade may be estimated by consideration of the balance of net exports over net imports. Table III reviews the position annually since the year 1923. From this data a balance is struck of the volume and value to Malaya of the year's trading.

In 1937, the net imports (excluding rubber) were 1,081,200 tons, valued at $103,200,000. Net exports (excluding rubber) were 328,500 tons, valued at $42,500,000. Malayan agricultural trade of crops other than rubber (the chief export crop) and rice (the chief import crop) shewed an excess of imports of 180,000 tons, valued at $22,480,000. Malaya thus draws on other countries to a large extent for many agricultural products to satisfy internal consumption. Chief amongst these may be mentioned the following net import figures:— rice 573,063 tons, valued at $38,211,000, tobacco 6,719 tons, valued at $15,994,000, milk to the value of $9,004,000, sugar 117,988 tons valued at $7,791,000, vegetables $4,877,000, fruits $4,268,000, groundnuts and groundnut oil $4,090,000, livestock and meat $5,657,000. All these import values shew a considerable increase over the corresponding figures for 1936, nearly 9 per cent. in quantity but nearly 16 per cent. in value.

With a measure of return to prosperity of the major industries of Malaya (tin and rubber) the country has increased her imports of agricultural products for local consumption and has been able to meet the increased cost of such goods as she requires. On the other hand, these increased demands for imported agricultural products have been more than adequately met by the improvement in her agricultural export trade. This is demonstrated by the fact that while the excess of total agricultural imports over exports was 284,500 tons, the excess value of Malayan agricultural exports over values of imports was $280,500,000, a figure which has not been exceeded since the year 1926. With the exception of the rubber and palm oil industries it cannot be said that there has been any marked increase in the importance of local agriculture, as indicated by exports, but the fact that several of the smaller industries shew a distinct revival is an encouraging feature, while the improvement of market prices, if maintained in 1938, should have the effect of encouraging greater production especially by small-holders who in particular benefit by improved market conditions of the, commercially, less important crops.

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THE MALAYAN RUBBER PLANTING INDUSTRY IN 1937.

Compiled from official and other records by the Economics Branch of the Department of Agriculture, S.S. and F.M.S.

Prices.—The monthly average Singapore spot price of No. 1 rubber smoked sheet was 36.47 cents per lb. in January and 35.89 cents in February, but improved to 39.80 cents in March and 40.25 cents in April. Thereafter, apart from minor fluctuations, the price fell steadily throughout the remainder of the year. The highest Singapore price of the year was 45⅜ cents at the end of March and the lowest was 22⅛ cents per lb. at the end of December. The average prices per lb. for the year in the chief markets are compared with those for 1936 in Table I.

Table I.

Prices per lb.

Market	1936	1937
Singapore (cents, Straits) ...	27.04	32.09
London (pence) ...	7.72	9.42
New York (cents, gold) ...	19.27	16.30

Areas.—The total area under rubber in Malaya at the end of 1937 was estimated to be 3,304,657 acres, as shewn in Table II.

The total area of reserve land on estates in Malaya at the end of 1937 was 620,076 acres, of which 23,514 acres were building sites, and 68,319 acres planted with other crops. The total mature area, *i.e.* planted during the season 1929-30 or earlier, was 1,847,218 acres, and the tappable area, as declared by estates, was 1,883,250 acres.

Ownership and Constitution of Estates.—Of the total area of estate rubber in Malaya 75.4 per cent. is European owned, 15.9 per cent. owned by Chinese, 4.3 per cent. by Indians, and 4.4 per cent. by other nationalities.

Of the 2,500 estates in Malaya, 878 (1,542,256 acres) are owned by public limited liability companies, while the remainder, 1,622 (484,092 acres), are in the hands of private limited liability companies or privately owned.

There were 1,557 estates (318,819 acres) between 100 and 500 acres in size, 358 estates (260,245 acres) between 500 and 1,000 acres, 532 estates (1,051,751 acres) between 1,000 and 5,000 acres, and 53 estates (395,533 acres) over 5,000 acres.

Production, Exports and Stocks.—The production of rubber in Malaya during 1937 amounted to 503,127 tons, as compared with 365,005 tons in 1936. The distribution of production in 1937 is shewn in Table III.

Table II.

Area Under Rubber in Malaya as at end of 1937.

(in acres)

Territory	Estates *			Small Holdings†	Planted Area
	Mature Area	Immature Area	Total Planted Area	Total Planted Area	
Perak ...	288,043	19,302	307,345	265,988	573,333
Selangor ...	330,393	21,448	351,841	142,910	494,751
Negri Sembilan ...	254,296	28,806	283,102	99,213	382,315
Pahang ...	83,270	7,868	91,138	83,995	175,133
TOTAL F.M.S....	956,002	77,424	1,033,426	592,106	1,625,532
Malacca ...	122,282	4,333	126,615	67,680	194,295
P. Wellesley ...	43,537	1,575	45,112	23,384	68,496
Penang ...	2,491	392	2,883	15,280	18,163
Singapore ...	32,969	211	33,180	19,568	52,748
Labuan ...	—	—	—	1,825	1,825
TOTAL S.S. ...	201,279	6,511	207,790	127,737	335,527
Johore ...	438,831	84,314	523,145	360,759	883,904
Kedah ...	199,716	8,936	208,652	96,274	304,926
Perlis ...	1,340	334	1,674	3,334	5,008
Kelantan ...	31,527	1,015	32,542	58,271	90,813
Trengganu ...	12,863	290	13,153	31,653	44,806
Brunei ...	5,660	306	5,966	8,175	14,141
TOTAL U.M.S. ...	689,937	95,195	785,132	558,466	1,343,598
TOTAL MALAYA ...	1,847,218	179,130	2,026,348	1,278,309	3,304,657

* Estates = 100 acres and over.
† Small Holdings = under 100 acres.
Acreage of mature rubber represents acreage planted in season 1929—1930 or earlier.

The area of tappable rubber on estates in Malaya at the end of 1937 was 1,883,250 acres, of which 24.8 per cent. (467,039 acres) was out-of-tapping, including areas rested under rotational systems of tapping. In the Federated Malay States 40.6 per cent. of the tappable area was out of tapping in January 1937, but this percentage fell steadily throughout the year to 31.6 per cent. in December with the increase in the export quota. Similarly in the Straits Settlements the percentage fell from 33.6 to 24 per cent. and estates in the Unfederated Malay States likewise increased their areas in tapping.

Table III.*

Malayan Production of Rubber in 1937

Area	Production by estates of 100 acres and over	Production by estates of less than 100 acres	Total Production
	Tons	Tons	Tons
Federated Malay States ...	166,255	91,134	257,389
Straits Settlements ...	26,560	16,730	43,290
Unfederated Malay States ...	121,843	80,605	202,448
TOTAL 1937 ...	314,658	188,469	503,127
TOTAL 1936 ...	233,118	131,887	365,005

* Abstracted from the December statement of acreage, stocks, production, imports and exports of rubber, etc., published by the Registrar-General of Statistics, Straits Settlements and Federated Malay States.

The exports of rubber in concentrated forms of latex increased over the previous year by 2,471 tons, as shewn in Table IV. The quantity of rubber estimated to be contained in this exported latex is included in the figures of production given above and also in the figures of total exports given in Table VI.

Table IV.

Exports of Rubber in Concentrated Forms of Latex.

Year	Dry rubber content of latex in lbs. per gallon			Total	Value
	Under 4.8 lbs.	4.8 to 5.7 lbs.	Over 5.7 lbs.		
	Tons	Tons	Tons	Tons	$
1931 ...	—	—	—	1,925	472,123
1932 ...	—	—	—	5,192	1,110,103
1933 ...	—	—	—	10,470	2,871,407
1934 ...	—	—	—	14,172	7,119,548
1935 ...	5,286	5,490	2,374	13,150	6,585,369
1936 ...	6,778	7,073	3,086	16,937	10,673,229
1937 ...	7,122	7,512	4,774	19,408	15,429,910

Table V.

Rubber Stocks in Malaya at end of 1937.

Stocks	Tons
At ports	12,210
In hands of dealers	53,850
On estates of over 100 acres	24,488
Total ...	90,548

Stocks held by small-holders are considered to be negligible.

Local consumption of rubber by manufacturers of rubber goods, tyres, tubes, belting, shoes, etc., amounted to 576 tons, as compared with 435 tons in 1936, 593 tons in 1935 and 872 tons in 1934.

Table VI.

Shipments of Crude Rubber from Producing Countries.*

(tons)

Year	Malaya includ: Brunei & Labuan	Netherlands Indies	Ceylon	Sarawak	Siam	French Indo-China	All other Sources	Total
1931	423,000	257,000	62,300	10,400	3,600	11,000	32,400	799,700
1932	406,000	211,000	49,300	7,100	3,000	13,500	18,800	708,700
1933	445,800	282,300	63,800	11,100	7,000	17,300	26,200	853,500
1934	467,400	379,400	79,100	17,600	17,700	19,600	38,300	1,019,100
1935	417,000	282,900	54,300	19,300	28,300	28,700	42,100	872,600
1936	353,667	309,630	49,685	21,013	34,578	40,769	46,285	855,627
1937	469,960	431,646	70,359	25,922	35,551	43,399	58,270	1,135,107

* Abstracted from the Statistical Bulletin of the International Rubber Regulation Committee, Vol. 4, No. 2, February 1938.

Operation of the Rubber Regulation Scheme.—Rubber production during the year was regulated in accordance with the International Agreement 1934-38, and the system continued to work smoothly. Malaya's quota was 589,000 tons and the releases were:—for the first quarter 75 per cent.; second quarter 80 per cent.; third and fourth quarters 90 per cent.

Under the agreement, replanting was permitted to the extent of 10 per cent. of each owner's holding in any one year and to a total of 20 per cent. of the holding during the period 1st June, 1934 to 31st December, 1938. The area replanted on estates during 1937 was 29,039 acres, much less than the total amount permissible under the agreement.

Budgrafting.—The total budgrafted area in 1937 and comparisons with previous years are shewn in Table VII.

Table VII.

Areas of Budgrafted Rubber in Malaya.

	1935		1936		1937	
	No. of areas	Total acreage	No. of areas	Total acreage	No. of areas	Total acreage
Federated Malay States ..	391	106,813	402	111,369	445	120,927
Straits Settlements ...	53	3,885	51	3,833	54	4,634
Unfederated Malay States ...	157	89,311	175	93,734	178	94,364
Total ...	601	200,009	628	208,936	677	219,925

The above table takes into account the proportion of budgrafts in areas under mixed budgrafts and seedlings. The actual area in Malaya of budgrafts only (approved clones) was 175,350 acres. There were 76,508 acres of mixed budgrafts and seedlings, and 13,377 acres planted with clonal seed.

At the end of 1937, of the total area of budded rubber (219,925 acres), 136,235 acres had reached the tappable stage, while the actual area of such rubber being tapped was 94,907 acres.

Conditions on Estates.—Estates generally are now maintained in good condition. Improvements begun during the last year or two were continued during 1937, but the rising cost of labour and the falling price of rubber suggest that expenses will have to be reduced in the near future. The area out of tapping was estimated to be 467,000 acres at the end of the year.

Methods of clearing ranged from simple tree-felling, with no stump or root removal, to clean-clearing, followed by deep digging and complete root extraction. From the point of view of root disease control, selective clean clearing of disease patches, with a minimum of root removal in the healthy areas, would appear to

be the most economical policy.

Manuring continued to engage the attention of estates during 1937. Convincing results are now being obtained from the experiments started a few years ago by the Rubber Research Institute of Malaya and by other concerns; it is, therefore, likely that manuring will become a standard practice on plantations, so long as the price of rubber does not fall much below its present level.

The scheme for experimental planting of new land was almost completed in 1937. Rubber Regulation permits new planting for experimental purposes up to a total of one-quarter of 1 per cent. of the total area under rubber in the country during the period of the agreement. The total allowance for Malaya is thus approximately 8,000 acres. The area approved for planting under this clause during 1937 was 3,346 acres, which left only 552 acres remaining out of the 8,000 acres. The allocations were made on a State basis, *i.e.* in proportion to the area of rubber in each territory. The experiments are carried out under the control of the Rubber Research Institute of Malaya, with whom and the Controller of Rubber the estate enters into an agreement as regards maintenance and continuity. The experiments are designed to investigate all important aspects of rubber planting.

Continued interest has been shewn by estates in cover plants, both planted and "natural" types. The value of covers in old rubber is well appreciated as is also the necessity for supplementing them with manures.

Conditions on Small Holdings.—Quarterly surveys clearly shewed the reduction in small holdings out of tapping which occurred during 1937. The increase in tapping was due primarily to the increased quota and to the fact that uncouponed rubber commanded very high prices, as dealers who had bought coupons without rubber had to cover such coupons with physical rubber by the end of each quarter.

There was a slight decrease in tapping in the fourth quarter due principally to wet weather which rendered tapping impossible and also to the Hari Raya (Mohammedan) festivities.

Table VIII summarizes the results of the quarterly surveys during 1937, and includes the December, 1936, survey for the purpose of comparison.

Table VIII.

Percentages of Areas of Small Holdings out of Tapping during 1937.

	Dec. 1936 Percentage	Mar. 1937 Percentage	June 1937 Percentage	Sept. 1937 Percentage	Dec. 1937 Percentage
F.M.S. ...	37.5	29.5	19.4	16.0	19.1
S.S. ...	18.0	22.7	10.7	7.9	10.1
U.M.S.	26.6	23.3	15.5	7.9	13.9
Malaya	30.8	25.7	16.8	11.7	16.0

The trade in coupons without rubber and in uncouponed rubber has again been a noticeable feature of the small-holding rubber market. In the first quarter of 1937 the value of coupons was from $32 to $35 per picul equivalent. uncouponed rubber being sold at prices ranging from $12 to $21 per picul.

In the second quarter the position was reversed, and, coupled with the weakening of the rubber market generally, coupons fell—in one district—from $35 in March to $10 in June, while uncouponed rubber improved in value by $8 per picul.

In the third quarter uncouponed rubber was still commanding a high price, but by the end of the quarter coupons were again improving, doubtless owing to dealers requiring to cover stocks with export rights. Coupons similarly improved in value in December, when required for balancing stocks, whereas in October and November their value was extremely low and in some districts they were practically unsaleable.

The generally improved conditions of small holdings are being maintained, particularly with regard to disease control and care of utensils. Small-holders, both Malay and Chinese, have responded well to the advice of the Asiatic Rubber Instructors.

Owner tappers are taking advice on better systems of tapping, but difficulties are encountered when owners will not adequately supervise paid labour, particularly where work is given to poorer relations.

Considerably more attention is now being paid to tapping methods and quality of tapping on small holdings, and this improvement is particularly noticeable on the medium-sized holdings of Chinese ownership. The tapping on such holdings is often equal to the standard of estate practice, and it is possible that in many cases the owners have gained their knowledge while employed on large estates in addition to benefiting from the practical demonstrations of the Asiatic Rubber Instructors.

Increasing attention has been given to budgrafting, and several small holdings in various parts of the country have undertaken budding with the co-operation and supervision of the Asiatic Rubber Instructors.

In Pahang a marketing scheme has been in operation for some time whereby dealers display samples of the various grades of rubber and pay higher prices for the better grades. This scheme worked smoothly throughout the year and provides a valuable guide to quality of production.

A large number of the cheap smoke-house approved by the Rubber Research Institute of Malaya were erected during the year, and partially as a result of their use the general standard of small-holding rubber has improved considerably. There is, however, a tendency to abandon the manufacture of smoked sheet and return to old methods, due principally to the small premium granted by dealers for smoked sheet which is often insufficient to repay the extra labour involved.

In Pahang the total number of cabinets erected by the end of the year was 166, practically all of which were in use. The value of this cheap form of smoke cabinet was strikingly demonstrated in Brunei where 194 were erected during the year, making a total of 212, the majority of which were in regular use. In Brunei,

owing to the loss involved in freight and export duty on wet rubber, the difference in price between smoked and unsmoked sheet was as high as $10 per picul for a considerable period in 1937, with the result that the amount of smoked sheet produced increased considerably.

Increased attention has been devoted in Kelantan to the manufacture of sheet rubber, as is demonstrated by the very large increase in the number of hand mangles imported during the year. During 1937, 2,058 machines were imported, as compared with 567 in 1936, and 483 in 1935. The Department of Agriculture supplied 249 machines to small-holders, as compared with 38 in 1936.

In Kelantan also, special attention was given to the use of suitable strainers, and 160 sieves of an approved type made locally were sold.

Pests and Diseases.—The general improvement of foliage noticed in 1936 was maintained in 1937, for the weather in most parts of the country about the time of wintering was unfavourable to an epidemic of the leaf-mildew *Oidium Heveae*. Thrips, mites and spiders gave some trouble in young rubber areas, and the practice of controlling them by sulphur-dusting found great favour. Much trouble was also caused in young areas by the giant snail. Fortunately, poison baits containing "Meta" (a patent fuel) proved very effective in checking this pest. The control of root diseases received increasing attention during the year, particularly in connexion with replanting. Experiments have been started by the Rubber Research Institute of Malaya to find the cheapest way of dealing with root diseases during planting, consonant with efficiency. Termites continued to do damage, and it is noteworthy that small-holders shewed an increasing tendency to treat this pest on approved lines. The cockchafer pest also occasioned much harm in a few areas, but fortunately did not spread as much as was feared; methods of treatment by soil fumigants at an economic cost have been devised.

Labour.—The total labour force employed on estates at the end of 1937 was 351,404, composed of 233,700 men, 92,857 women, and 24,847 children, or 17.3 labourers employed per 100 planted acres of rubber. At the end of 1936 the total estate labour force was 278,515 persons, or 13.7 per 100 acres.

Acknowledgments.

Acknowledgment is made to the Rubber Research Institute of Malaya for the information contained in this article relating to conditions on estates, and to pests and diseases. Acknowledgment is also made of information on the operation of the Rubber Regulation Agreement supplied by the Controller of Rubber, Malaya.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

1st Quarter 1938.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

Weather conditions were normal for the first quarter of the year. January and February were dry, with drought conditions in some districts, and March was very wet. Abnormal rainfall was experienced in February in Kedah.

Prices and Production.

Prices paid for small-holders' rubber are summarized in Tables I and II, which shew the extremes and means of prices recorded at a number of centres in each State.

The price of ordinary rubber followed the trend of the Singapore market, but the value of uncouponed rubber fell heavily and in Selangor was as low as $5 per picul in March, while in Malacca it was reported as almost unsaleable. The value of coupons improved sharply at the commencement of the quarter, rising to $20 per picul equivalent in Perak South, but in March a fall of $2 was recorded. In Kedah, coupons were realizing $12 per picul equivalent, while uncouponed rubber was sold at $7 to $7.50 per picul.

Production of small-holding rubber for the quarter is shewn in Table III which is prepared from the monthly reports of production, stocks, imports and exports of rubber, published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping and Condition of Holdings.

There was a considerable increase in the number of small holdings out of tapping in the quarter under review. Tables IV and V tabulate the results of the quarterly survey and provide a comparison with previous quarters.

The reduced coupon allowance coupled with the low price for uncouponed rubber is probably the primary cause of the reduction of tapping, but the first quarter of the year includes the "wintering" period and is also the time of the padi harvest in certain districts. In Selangor, in the inland districts, reduction in tapping took place owing to work commencing on the preparation of padi land for the new season's crop. The heavy rains of March were a further cause of reduced tapping.

The considerable percentage of untapped holdings in the Dindings is attributed to the fact that owners probably make a larger income by fishing or following some other form of occupation.

Reports indicate that the general improved condition of holdings is being maintained except in certain cases where padi harvesting has interfered with work on rubber holdings.

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	26.00-31.50	24.00-29.00	26.00-29.50	25.00-29.00	22.50-29.50	28.50-31.00	27.00-29.00	24.50-30.00
Unsmoked sheet	25.00-30.50	22.00-27.50	23.00-27.50	23.00-27.00	21.50-27.50	25.00-28.50	23.50-28.00	23.00-29.00
Scrap	16.00-20.00	15.00-21.00	19.00-21.00	—	18.00-20.00	17.50-22.50	18.00-22.00	16.50-21.00
			FEBRUARY					
Smoked sheet	26.00-31.00	25.00-31.10	25.00-29.60	26.00-34.00	24.50-30.00	29.50-31.00	27.50-30.00	23.60-29.60
Unsmoked sheet	25.00-30.00	23.00-28.30	22.00-27.50	23.00-29.00	24.00-28.50	26.00-30.00	24.00-28.50	22.00-29.00
Scrap	15.50-20.00	17.00-22.00	20.00-21.50	—	18.00-21.00	20.50-23.00	17.00-23.00	16.00-22.50
			MARCH					
Smoked sheet	23.00-28.50	23.00-29.50	23.00-29.60	24.00-28.80	21.50-29.80	24.50-29.00	19.00-29.80	22.50-29.50
Unsmoked sheet	22.50-27.50	20.50-28.00	20.00-26.50	18.00-27.50	20.50-27.00	22.50-28.00	16.50-28.00	21.00-27.50
Scrap	14.00-21.00	16.50-20.00	17.00-19.00	—	17.00-22.00	18.50-20.00	13.00-20.00	15.00-22.00

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.
(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JANUARY				
Smoked sheet	27.17-29.33	26.13-27.97	27.08-29.05	26.04-28.50	25.84-27.66	28.83-30.00	27.62-28.88	26.50-27.95
Unsmoked sheet	26.12-29.00	23.53-25.48	24.25-26.75	24.10-26.70	23.94-25.95	26.50-28.00	25.00-26.75	25.01-26.83
Scrap	16.75-18.75	17.67-19.00	19.50-20.50	—	18.00-20.00	19.83-21.00	19.12-21.75	18.02-19.82
				FEBRUARY				
Smoked sheet	27.17-29.30	26.60-28.59	26.92-28.52	27.50-30.15	26.33-28.57	29.66-30.50	28.00-29.88	26.01-28.15
Unsmoked sheet	26.00-28.55	24.46-26.41	23.70-25.90	24.20-27.20	24.54-26.60	27.17-28.83	25.12-27.62	24.90-27.19
Scrap	16.88-18.50	17.00-22.00	20.75-21.25	—	18.00-21.00	20.83-22.17	18.88-21.50	19.60-20.87
				MARCH				
Smoked sheet	24.83-27.50	24.99-27.44	24.33-26.52	25.44-28.06	23.58-27.77	25.33-27.17	21.12-27.20	25.04-27.36
Unsmoked sheet	23.62-26.75	22.48-25.01	21.83-24.83	21.40-26.16	21.50-25.14	23.84-26.00	18.38-25.00	23.33-25.98
Scrap	15.50-18.00	18.25-19.00	17.50-18.50	—	17.00-22.00	19.00-19.83	15.00-18.50	17.66-19.76

Table III.

Production of Rubber on Small Holdings

(in tons)

	Total Year 1937	1st Quarter 1937	1st Quarter 1938
Federated Malay States	91,131	19,764	17,967
Unfederated Malay States	80,605	19,310	16,749
Straits Settlements	16,730	3,769	3,298
Total ...	188,469	42,843	38,014

Diseases.

Mouldy Rot was little in evidence during the dry months of January and February, but became more prevalent with the wet weather of March. Satisfactory control of the cases encountered was maintained.

Following the cessation of "wintering" several cases of *Oidium Heveae* were reported in most parts of the country, but attacks were generally of a mild nature, except in Penang and Province Wellesley where the disease was widespread and more serious than in previous years. In the latter cases only late-wintering trees were attacked but some of them lost as much as approximately 90 per cent. of their new canopy. A certain amount of the reported damage was done by thrips.

Sporadic outbreaks of Pink Disease were encountered, but in most cases control measures were practised at an early stage.

The two root diseases, *Fomes lignosus* and *Fomes noxius* are still much in evidence in Kinta and Batang Padang, Perak, and in the majority of cases small-holders do not attempt control. Observations on the rate of spread of these diseases were made during March, but in six 1 acre plots no fresh infection had occurred since November.

Slight soil erosion is mentioned in the Pahang report, but serious cases have been encountered in Province Wellesley owing to clean weeding. In Penang frequent visits are necessary to ensure that the advised methods of erosion control are being strictly followed.

General.

Some small-holders are taking an interest in replanting. Four Chinese in Penang have commenced replanting, and others have applied for permission,

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of March, 1938.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	5,800	16
Kinta	38,874	3,900	10
Kuala Kangsar	92,166	24,900	27
Upper Perak	15,590	6,700	43
Larut & Selama	43,132	4,700	11
Krian	9,408	7,700	82
Lower Perak*	26,735	6,700	25
Dindings	9,873	7,300	74
	271,965	67,700	25

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang†	16,143	5,600	35
Kuala Langat†	23,881	7,600	32
Ulu Langat	45,012	11,300	25
Ulu Selangor	31,463	8,800	28
Kuala Lumpur	20,277	9,700	48
Kuala Selangor†	8,417	2,600	31
	145,193	45,600	31

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	23,639	18,900	80
Tampin	21,896	14,900	68
Kuala Pilah	31,832	12,700	40
Jelebu	9,097	1,500	17
Port Dickson	11,133	9,000	81
	97,597	57,000	58

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	10,534	4,700	45
Kuala Lipis	15,457	1,200	8
Bentong	12,224	2,600	21
Other Districts†	46,373	10,200	22
	84,588	18,700	22

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	14,093	6,800	48
Alor Gajah	30,838	3,700	12
Jasin	25,286	5,300	21
	70,217	15,800	22

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,549	2,000	57
Central	10,785	2,800	26
South	8,936	5,400	60
Penang	15,822	900	6
	39,092	11,100	28

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	20,115	2,000	10
	20,115	2,000	10

JOHORE	350,007	66,500	19
KEDAH	102,126	28,600	28
PERLIS	2,916	22,100	27
KELANTAN &‡	49,133		
TRENGGANU	29,836		

The percentage of areas out of tapping in December, 1937, was as follows:—Perak 13, Selangor 16, Negri Sembilan 46, Pahang 11, Malacca 9, Penang and Province Wellesley 13, Singapore 10, Johore 16, Kedah 11.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.
Comparison of Areas of Rubber Small Holdings Out of Tapping.

	March, 1937		December, 1937		March, 1938	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S.	158,900	29.5	114,400	19.1	189,000	31.5
S. S.	28,100	22.7	13,100	10.1	28,900	23.1
U.M.S	111,600	23.3	74,300	13 9	117,200	21.8
Malaya	298,600	25.7	201,800	16.0	335,100	26.9

including a Malay in Province Wellesley. A certain amount of replanting is also reported from Pahang.

The Krian report states that the preparation of smoked sheet has decreased during the quarter under review, due largely to lack of time, small-holders working in padi fields or on various Government contracts. In some cases, however, the owners say that as they have insufficient money they cannot wait to have their sheets smoked before sale.

Interest in, and the use of, smoke cabinets have not been maintained owing to the present low value of rubber, but in Pahang 55 new cabinets were erected during the quarter, making a total of 221 in the State.

In Perak South a Malay owner of about 500 acres of rubber has built a 40 picul cabinet at a cost of over $1,000. He proposes to smoke the sheet of other small-holders and also has become established as a dealer in direct competition with the ring of Teluk Anson dealers.

A scheme for improving rubber in Batang Padang, Perak, came into force on the 1st February whereby all dealers have to display a board exhibiting samples of five grades of smoked rubber together with the prices which they are willing to pay for each grade. A similar scheme which has been in operation in Pahang for some considerable time continues to work smoothly and provides a valuable guide to quality of production.

Further budgrafting has taken place in Johore, and in the Muar District some 715 trees were budded under the supervision of the Asiatic Rubber Instructor. Despite the prolonged dry spell in February a 56 per cent. success was recorded.

All reports comment on the worsened economic conditions which rubber small-holders are at present experiencing owing to reduced quota and lower market values. As a result, small-holders are turning their attention to other crops and others means of livelihood.

Miscellaneous.

ANNUAL PRIZE DISTRIBUTION, SCHOOL OF AGRICULTURE, MALAYA.

The annual prize distribution at the School of Agriculture, Malaya, was held at Serdang on Thursday morning, April 14th, 1938. In addition to the staff and students there were present the Hon'ble the Federal Secretary (Mr. C. D. Ahearne) and the following members of the School Advisory Committee, Messrs. R. Boyd, H. A. R. Cheeseman, W. E. Wallis, W. A. Stanton, J.P., and the Hon'ble Mr. Cheok Huan Cheong, M.S.C.

The Principal of the School (Mr. G. E. Mann, M.C.) opened the proceedings by regretting that the Adviser on Agriculture was unable to preside owing to indisposition. After welcoming the visitors, Mr. Mann reviewed the progress of the school during the past school year. He recorded that the present school year commenced with a complement of 73 students and pupils, seven short of the maximum capacity. Two Government scholars were allowed to resign and 3 private students were withdrawn during the year, leaving 68. Of these, 24 second year students and 24 one year course pupils were leaving that day on the completion of their training, while indications were that about the same number would be newly admitted when the School reopened in May.

Mr. Mann continued: "There have been no important changes in the purely agricultural side of our training other than the inclusion in the Two Years Course of a series of lectures on Estate Records and Reports, in the preparation of which we received material assistance from the planting members of our Committee. I may also mention in this place our indebtedness to the Federated Engineering Company for supplying a 4-roll hand-sheeting battery at considerably below the usual price. With this machine, we can now demonstrate up-to-date practice in the machining of sheet rubber. I am glad to say that, with the kind assistance of the Controller of Labour who loaned us a really good teacher, the instruction of selected students in colloquial Tamil has improved considerably and may apparently now be regarded as satisfactory. While that has been happening, the F.M.S. scheme for major scholarships has been changed by raising the number of scholarships to eight and by reserving only half instead of all of them for Malays. Further, Government has approved a scheme for the creation of certain continuation scholarships and paid apprenticeships which will enable approved Malay candidates to spend 6 months on the Rubber Research Institute Experiment Station at Sungei Buloh followed by a further 6 months on a selected estate. So, you see, we are now provided with the necessary machinery for turning out a very much better type of Malay estate employee than formerly. Unfortunately, in a sense, we shall not be able to take full advantage of this scheme this year, in that the Rubber Research Institute has recently decided to increase its staff of Asiatic Rubber Instructors and will therefore be taking the pick of those Malay students who are leaving to-day.

This leads me to the question of employment generally. Of the 267 students and pupils who have either passed through this School or are in the School to-day, 153 are known to have obtained employment in one capacity or another. The actual figure is probably higher because some 20 old boys have failed to keep in touch with us. Of the 48 students and pupils leaving to-day, 18 or 19 are already assured of employment, subject of course to their gaining the necessary medical certificates. Three Chinese and one Malay will be entering the Department of Agriculture, S.S. and F.M.S.; eight Malays will be entering the various Agricultural Departments of the Unfederated Malay States and North Borneo, while the Rubber Research Institute is taking at least three Malays as Asiatic Rubber Instructors and two Chinese as laboratory assistants. The total of 18 or

19 appointments includes seven for pupils from the One Year Course, leaving 16 pupils to return to their kampongs and one to resume duty as an Assistant Penghulu in Selangor. The majority of 2nd year students who are leaving without an actual appointment are Chinese, and these will presumably lose little time in finding employment for themselves, like many of their predecessors in the School; but, if they find difficulty in this respect, they can rely on the staff of the School to keep them informed of any vacancies which are known to exist on estates.

We continue to be rather proud of our poultry section at the School and it may interest you to know that, from only 1½ acres of land under chickens, we received $960 from actual sales during 1937, while live birds and eggs for hatching valued at over $300 were distributed free to other departmental poultry stations. All birds are kept in pens and their health has been satisfactory. The staff has dealt with numerous requests for advice, in dealing with which the three advisory leaflets we have had printed were found to be very useful."

After referring to recreation during the past year, and to the publication of the second number of the School Magazine, Mr. Mann thanked the school staff for their keen and loyal support, and particularly thanked Mr. Dawson for the careful and able way he had carried on the duties of Principal during the period of the speaker's absence on leave. He also thanked the staff of the Central Experiment Station for their continued assistance in connexion with the students' field work, and congratulated the students on their continued good spirit and behaviour.

Mr. Mann then called upon Mr. Ahearne to distribute the prizes, diplomas, and certificates which had been awarded in respect of the various courses of training, after which Mr. Ahearne addressed the students.

Mr. Ahearne thanked the Principal for giving him the opportunity of meeting and addressing the students. He regarded the School as one of the most important contributions the Government had made to the welfare of Malaya, and the students as fortunate in the choice of their calling. He referred to the greatness and diversity of agriculture in this country and to the importance of making available the accumulated knowledge regarding the many problems of agriculture, and pointed out how essential it was, therefore, that there should be trained men to make the best of their ancestral lands and to act as advisers to those who do not possess this knowledge. The School, he thought, would have its maximum effect in thus improving agriculture and the position of the agriculturist.

The speaker was of opinion that there would be an increasing demand for locally-qualified men to take part in the management of large-scale agricultural undertakings. The School would provide men with the necessary knowledge but ultimate success or failure would depend on the character and ability of the men themselves.

The Director of Co-operation, F.M.S. and S.S. (Mr. Boyd), proposed a vote of thanks to Mr. Ahearne which was seconded by Mr. Cheeseman, Chief Inspector of English Schools, S.S. and F.M.S., who in the course of his remarks referred to the appreciation felt by the Education Department for the co-operation of the School of Agriculture. He concluded by hoping that the time was not far distant when every village and town school in this Peninsula, not only Vernacular but also English, would have its school-garden, as he felt that they could teach through that medium that which cannot be taught in any other way.

Reviews.

Latex and Rubber Derivatives and their Industrial Applications.

Vols. II and III. By Frederick Marchionna (The Rubber Age, New York) 1670 pp. $20 (gold).

Volume I of this encyclopaedic work, published in 1933, is so well known that the new volumes, constituting a supplement to the original work, will immediately commend themselves without comment to all rubber technologists. The new volumes preserve the highly acceptable format of the original work. The subdivision into chapters follows the same general lines, though the great developments in latex technology in recent years have necessitated the splitting of certain of the original chapters into a number of new ones, and the introduction of new subject headings. The type, the same as that used in the original volume, is notable for its easy legibility—a particularly valuable feature in a work of this kind—while access to any desired item amongst the great mass of material presented is rendered easy by the admirable series of comprehensive indexes.

A new feature which will be greatly appreciated is the supplementing of Mr. Marchionna's own admirable introductory remarks to selected chapters by a series of articles contributed by acknowledged experts in the field concerned. The names of these contributors—Fisher, McGavack, Schidrowitz, Twiss, Szegvari, Beal, Richter and Schur, Sebrell and Morris—speak for themselves. It is doubtless due to the limited space at his disposal that Dr. Fisher's contribution on "The Composition and Structure of the Rubber Hydrocarbon" deals somewhat summarily with subjects which are surely still open to discussion, *viz.* the molecular weight and the geometrical configuration of the rubber hydrocarbon.

Those working on the production side of the industry will naturally regret the curtailment in the new volumes of the chapters dealing with their own aspect of the subject (matter dealing with the production of latex for export now occupies only 146 pages out of a total of 1432 as against 357 out of 886 pages in the original work), but this is doubtless inevitable in view of Mr. Marchionna's declared main purpose of comprehensively surveying the field of the technology of latex and rubber derivatives. For the same reason, much published work which the author regards as being of purely academic interest has been omitted; but the book nevertheless presents an excellent summary of much work of purely scientific import.

Unfortunately, or perhaps one should with respect to a work of this size say inevitably, a considerable number of minor typographical errors have crept in, but no serious blemishes have been detected.

The book is a splendid tribute to Mr. Marchionna's immense industry and to his fine critical faculty, which must have been almost constantly employed over a period of years in the production of this invaluable work.

K. C. R.

A Malayan Bibliography.

By J. H. M. Robson, C.B.E. Privately published. 48 pp. 6th Edition, March, 1938.

In presenting his 6th edition of a classified bibliography of the literature concerning Malaya—to which he appends a list of some books concerning Borneo—Mr. Robson gives to students, and to all those interested in this country, a reference list of great value. Mr. Robson's task has, one feels sure, been a source of great satisfaction to himself, for during his long journalistic career in Malaya he must have felt the need of such a list, while, no doubt, in recent years, when he has withdrawn somewhat from his public activities, his study of Malaya has strengthened his conviction that a bibliography would be of value to himself and to his friends.

In conversation, Mr. Robson has stated that he will be pleased to present a copy of this Bibliography to those sufficently interested to write to him, his address is 1, Mount Road, Kuala Lumpur. We anticipate that many will avail themselves of this offer, and Mr. Robson will, thereby, extend his circle of those who are genuinely interested in the literature of Malaya.

D.H.G.

Tamil Agricultural Journal.

Readers in Malaya are reminded that an agricultural journal in Tamil is published by the Department of Agriculture, three numbers of which have already been issued. The articles contained in these numbers are as follows:—

No. 1 Gingelly, Soil Erosion, Manufacture of Smoked Sheet on Small Holdings, The Quality of Copra, White Ants in Coconuts.

No. 2 Tobacco, Hatching under a Broody Hen, Groundnuts, Dairying.

No. 3 The Preparation of Smoked Sheet on Small Holdings, with a Description of Suitable Forms of Smoke Houses.

Copies of any of these publications will be sent free of charge to any address in Malaya, and the Editor would be pleased to hear from managers of estates and others who desire that copies of future numbers should be regularly supplied for the information of the Tamil labour force.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

April, 1938.

The Weather.

In Kedah, Province Wellesley and Perak there was very heavy rainfall and the total precipitation was much above average. Floods have been reported from several areas in Province Wellesley and Perak.

The northern parts of Selangor were also abnormally wet, while the rainfall in the south of that State was normal. In Negri Sembilan, Malacca and Johore down to Singapore the weather was cool and cloudy but the rainfall approximated to normal with some local variations. Along the west coast of Johore thunderstorms were of frequent occurrence and rainfall high.

In Kelantan the weather was more than usually hot and dry but the rainfall on the east coast of Pahang was above normal.

Remarks on Crops.

Rubber.—The price of smoked sheet paid by dealers in the rural areas ranged between $18 and $26; the lower prices occurred during the middle of the month. At the end of the month the price rose again to the previous level. The value of export rights varied from $12 to $16 per picul.

The effect of low prices, augmented in many parts of the country by heavy rain, has greatly increased the number of holdings which are out of tapping. Most of the small holdings still in tapping are now being tapped by the owners. Where a labourer is employed to tap he receives as much as half to two-thirds of the crop as wages, (the price of uncouponed rubber is now worth only $6 to $7 per picul). In Province Wellesley some medium-sized estates have closed down and are selling their coupons.

Padi.—Harvest has now practically been completed throughout the country. The few areas which still remain are being reaped with difficulty owing to the frequent rain. In Krian much of the padi is of poor quality; the season's crop is smaller than the previous one whilst the price remains much the same as last season. Middlemen and planters are as usual holding their padi hoping for a rise in price. During the month 35,029 sacks of S.K.48 were sealed, bringing the total up to 70,465. Inspection and sealing appears to be proceeding satisfactorily but definite figures of the amount for which premium has been paid by the Government rice mills is not yet available.

Fruit.—In Perak the demand is maintained for good quality fruit trees, and at present exceeds the supply. The stocks of fruit trees at the Agricultural Stations are being increased. Work on the new fruit Station at Ayer Tawar is proceeding.

The Agricultural Officer, Malacca, reports that following the extensive shooting of squirrels the decrease in the damage done to the fruit crop is already apparent. During the last few months some 17,700 squirrels have been accounted for.

DEPARTMENTAL NOTES.

Meeting of the Advisory Committee, School of Agriculture, Malaya.

A meeting of the Advisory Committee, School of Agriculture, Malaya, was held at the School on 14th April 1938. In the absence of the Adviser on Agriculture, the Principal of the School was voted to the Chair.

Arising from the minutes of the previous meeting, which were confirmed, the Principal described how the teaching of colloquial Tamil had been improved during the past year and might now be considered satisfactory. It was agreed that a more reliable impression should be obtainable in a year's time.

The Annual Report for 1937, having been circulated, was confirmed, and various matters arising therefrom were discussed.

Amongst other matters discussed were the title of Senior Lecturer, assistance to staff during leave of European officers, and the distribution of the School prospectus to Chinese estate owners.

Appointments.

Mr. P. R. Davidson, B.Sc. (Agric.), N.D.A., Agricultural Officer, Uganda, has been appointed to be an Agricultural Officer, Department of Agriculture, Straits Settlements and Federated Malay States, with effect from the 10th February, 1938, inclusive. Mr. Davidson arrived on the 15th March, 1938.

Mr. W. N. Scott, B.Sc., B.Agr., Ph.D., has been appointed to be an Agricultural Officer, Department of Agriculture, Straits Settlements and Federated Malay States, with effect from 11th February, 1938, inclusive. Mr. Scott arrived on the 10th March, 1938.

Mr. T. W. Brown, B.Sc. (Agric.), Ph.D., has been appointed to be an Agricultural Officer, Department of Agriculture, Straits Settlements and Federated Malay States, with effect from 1st March 1938, inclusive.

Transfer.

The policy of engendering and maintaining a close relation between the Field Branch and the Agricultural Division of the Department by the occasional exchange of officers has been approved, and it is expected to prove of benefit to both sections. Further to implement this policy, Mr. J. L. Greig, Agriculturist, has been appointed to officiate as Agricultural Officer, Perak Central, with effect from 18th April 1938.

Leave

Mr. J. Fairweather, Agricultural Officer, returned from leave on 11th February 1938.

Mr. T. D. Marsh, Agriculturist, returned from leave on 14th April 1938.

The leave of absence granted to Mr. C. W. S. Hartley, Agricultural Officer, has been further extended for one month with effect from 6th May 1938, inclusive.

Statistical.

MARKET PRICES.

April, 1938.

Major Crops.

Rubber.--The market recovered from the severe set-back of the previous month, although the opening price of 16 cents was a further fall and was the lowest quotation recorded since 1934. Spot loose opened in Singapore at 16 cents per lb. but immediately improved to 17$\frac{3}{4}$ cents, continuing a steady advance to 21$\frac{3}{8}$ on the 23rd April. Thereafter the market again weakened and closed at 18$\frac{1}{2}$ cents.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 19.26 cents per lb., as compared with 21.74 cents in March. The London average price was 5.77 pence per lb., and the New York price 11.69 cents gold, as compared with 6.69 pence and 14.65 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, April, 1938.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.		Batu Pahat, Johore.			
	7	14	21	28	13	20	6	13	20	27
Smoked sheet	21.50	24.70	24.10			24.00			22.50	
Unsmoked sheet	20.00	22.00	22.94	22.00	21.36	21.00	16.25	20.50	21.00	19.80
Scrap										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases at Kuala Kangsar on the 6th and 27th April.

Palm Oil.—The market fell heavily in the early part of April, but recovered in the second half as shewn in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
April	1	£ 14. 0. 0	£ 9. 2. 6
,,	8	12. 15. 0	9. 10. 0
,,	15	13. 10. 0	9. 5. 0
,,	22	14. 2. 6	9. 7. 6
,,	29	14. 0. 0	9. 5. 0

Copra.—After an initial slight fall, the market recovered and maintained a certain improvement throughout the month, still rising at the close to reach $3.80 per picul. The sun-dried grade averaged $3.62 per picul for the month, as compared with $3.68 in March, and the mixed grade continued 40 cents lower.

Copra cake was unchanged at $1. 80 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in March were as follows:—Siam No. 2 (ordinary) $4.09; Rangoon No. 1 $3.62; Saigon No. 1 $3.92; as compared with $4.15, $3.82, and $3.92 in February, and with $4.44, $3.60, and $3.82 in March 1937.

The average retail prices in cents per gantang of No. 2 Siam rice were again unchanged and were:—Singapore 28, Penang 32, Malacca 28.

The average declared trade value of imports during March was $3.89 per picul as compared with $3.85 in February and $4.04 in January.

Padi.—The Government Rice Mills, Perak, continued to pay $2.10 per picul for padi. Retail prices of padi ranged from 6 to 14 cents per gantang.

Pineapples.—Prices per case of canned pineapples continued unchanged at: G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and $2.95 respectively.

Prices of fresh fruit per 100 for canning were as follows:— Singapore 45 to 90 cents; Johore, 1st quality 50 to 70 cents, 2nd quality 30 to 55 cents, 3rd quality 20 to 35 cents.

Beverages.

Tea.—Ten consignments of Malayan tea were sold on the London Market during April, three upland and seven of lowland tea. The upland tea averaged 1s. 2½d., 1s. 2¾d. and 1s. 3¼d. per lb., and the average prices of the lowland tea ranged from 1s. 0d. to 1s. 1¾d. per lb.

Average London prices per lb. during April for consignments of tea from other countries were as follows:— Ceylon 1s. 4.17d., Java 1s. 2.56d., Indian Northern 1s. 2.04d., Indian Southern 1s. 3.81d., Sumatra 11.68d.

The latest Colombo average prices available, quoted from *The Weekly Tea Market Report,* 26th April, 1938, of the Colombo Broker's Association, are as follows, in rupee cents per lb.: High Grown Teas 75 cents, Medium Grown Teas 66 cents, Low Grown Teas 62 cents.

Coffee.—Sourabaya and Palembang coffee improved slightly during April. Sourabaya averaged $11.88 to $12.94 per picul and Palembang $8.44 to $9.44, as compared with $10.95 to $11.75 and $7 to $8 respectively in March.

Prices in Singapore of other varieties of coffee were as follows (per picul):— Liberian $14; Excelsa $9.50, closing at $10; Robusta $6.50, falling to $6 at the close.

Arecanuts.—The range of Singapore prices per picul during the month was as follows:— Splits $4.24 to $7.12; Red Whole $4.50 to $5.62; Sliced $5.50 to $9.62.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $7.45, Medium $6.95, Mixed $6.50.

Pepper.—The market was stagnant and prices remained at the following levels throughout the month:—Singapore Black $8.25, Singapore White $13.75, Muntok White $14 per picul. The March averages were $8.75, $14.56 and $15.06 per picul respectively.

Nutmegs.—The price of both 110's and 80's was $32 per picul throughout the month, falling at the close to $31, with an average of $31.80 as compared with $30.50 in March.

Mace.—Prices continued unchanged throughout the month at: Siouw $90, Amboina $75 per picul.

Cloves.—Zanzibar and Amboina continued unchanged at $40 per picul (nominal).

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for April at Rs. 1.25-Rs. 1.37 rising to Rs. 1.35-Rs. 1.44 at the close.

Miscellaneous.

Derris (Tuba Root).—There was a slight increase of $1 per picul in values of derris roots. Roots sold on rotenone content averaged $25 per picul, and on a basis of ether extract $15 per picul. Another source quotes $16 on a basis of ether extract (15 per cent.).

Gambier.—Block was quoted throughout the month at $7 per picul, and No. 1 Cube $15.50 per picul. The March average prices were $7.38 and $15.88 per picul respectively.

Tapioca.—Flake Fair continued unchanged at $4.25 per picul. Seed Pearl was quoted throughout at $4.40, falling to $4.25 at the close, with an average of $4.37. Medium Pearl was quoted throughout at $5 per picul.

Sago.—Prices weakened in April. Pearl, Small Fair, averaged $3.87 per picul. Flour, Sarawak Fair, $2.19, as compared with $4.06 and $2.37 in March.

Tobacco.—The general range of prices per picul for dried leaf was as follows:—1st quality $25 to $45; 2nd quality $20 to $35; 3rd quality $10 to $30. Prepared tobacco prices were:—Kelantan 1st quality $110, 2nd quality $85, 3rd quality $65; Negri Sembilan $58, $48, and $15 to $38. Java tobacco in Johore was sold at $40 to $95 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., and Messrs. Hooglandt & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and fourpence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY*

March 1938.

Malaya.—Imports of foreign rice during March were 70,172 tons† and exports 16,371 tons, net imports being 53,801 tons as compared with 32,236 tons in 1937¶.

Of the March imports 44 per cent. were consigned to Singapore, 23 per cent. to Penang, 5 per cent. to Malacca, 19 per cent. to the Federated Malay States, and 9 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets): Siam 41,844 (59.6), Burma 26,009 (37.1), French Indo-China 1,337 (1.9), other countries 982 (1.4).

Of the exports during March 76 per cent. were consigned to the Netherlands Indies and 24 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 11,568 (70.7), Burma 4,149 (25.3), French Indo-China 459 (2.8), parboiled 61 (0.4), local production 134 (0.8).

India and Burma.—Exports from India in January and February totalled 36,000 tons as compared with 285,000 tons in 1937, a decrease of 87.4 per cent. Of these, 5.6 (3.8) per cent. were to the United Kingdom, 5.6 (5.3) per cent. to the Continent of Europe, 44.4 (32.3) per cent. to Ceylon, 5.5 (29.1) per cent. to the Straits Settlements and the Far East, and 38.9 (29.5) per cent. to other countries. The figures in brackets are for 1937.

Burma's exports from the 1st January to 23rd March totalled 855,223 tons as compared with 836,070 tons in 1937, an increase of 2.3 per cent. Of these, 45.7 (47.7) per cent. were to India, 9.8 (9.6) per cent. to the United Kingdom, 5.7 (2.1) per cent. to the Continent, 12.9 (13.1) per cent. to Ceylon, 14.6 (14.3) per cent. to the Straits Settlements and the Far East, and 11.3 (13.2) per cent. to other countries. The figures in brackets are for 1937.

Siam.—Exports of rice and rice products from Bankok during January were 113,954 tons as compared with 91,991 tons in 1937.

Japan.—The latest information available was published in the February Summary.

French Indo-China.—Entries of padi into Cholon during the first three months of the year totalled 412,694 tons as compared with 438,339 tons in 1937, a decrease of 5.9 per cent. Exports of rice during the same period were 405,519 tons, an increase of 2.5 per cent. when compared with the previous year.

Ceylon.—Imports of rice during the first quarter of 1938 aggregated 147,320 tons as compared with 142,612 in 1937, an increase of 3.3 per cent. Of these imports 14.4 (16.2) per cent. were from British India, 74.0 (72.0) per cent. from Burma, 0.7 (0.2) per cent. from the Straits Settlements, and 10.9 (11.6) per cent. from other countries. The percentages in brackets are for 1937.

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* Abridged from the Rice Summary for March 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Europe and America.—Shipments from the East to Europe from the 1st January to the 3rd March totalled 111,844 tons as compared with 159,414 tons in 1937, a decrease of 29.8 per cent. Of these shipments, 40.3 (41.7) per cent. were from Burma, 44.5 (40.2) per cent. from Saigon, 13.5 (13.4) per cent. from Siam, and 1.7 (4.7) per cent. from Bengal. The figures in brackets are the corresponding percentages for 1937.

FERTILIZER PRICES, APRIL, 1938.

The following are the prices at the end of April, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotation for sulphate of potash *ex* warehouse, Port Swettenham, F.M.S. or Singapore. All other quotations are *ex* warehouse Port Swettenham, Klang or Singapore.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Mar. 1937	Jan./Mar. 1938	March 1937	March 1938
Arecanuts ...	30,084	8,516	11,331	3.190	4,450
Coconuts fresh † ...	95,223†	17,732†	22,745†	6,291†	10,734†
Coconut oil ...	39,762	8,454	11,505	2.490	4.613
Copra ...	75,592	16.124	10,140	8,089	3,403
Gambier, all kinds ...	1,955	524	425	186	180
Copra cake ...	15,026§	3,617§	1,603	1.333§	920
Palm kernels ...	7,312	1,570	2,176	539	1,005
Palm oil ...	42,787	9,135	12,950	3.573	5.691
Pineapples canned ...	80,502	19,071	20,211	6.781	8.767
Rubber ¶ ...	503,127¶	113,111¶	108,455¶	38,443¶	35,972¶
Sago,—flour ...	15,478	6,791	2.520	3,760	2,014
,, —pearl ...	3,759	881	962	250	328
,, —raw ...	8,256*	1,935*	1,710*	756*	555*
Tapioca,—flake ...	1,058	323	246	92	54
,, —flour ...	2,393*	501*	858*	67*	252*
,, —pearl ...	18,786	3,703	4,070	1.059	1,924
Tuba root ...	573	176	80	36	27

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March ...	2,359.6	1,843.1	446.8	344.0
Total	6,641.7	4,609.4	1,200.9	837.0
Total Jan. to March, 1937 ...	5,542.8	4,190.2	1,042.7	720.8
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 31st March, 1938 were: palm oil 3,639 tons, palm kernels 691 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST MARCH, 1938.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED — ESTATES WHICH HAVE ENTIRELY CEASED TAPPING: Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping — Otherwise than under rotational systems: Acreage	Percentage of (7) to (2)	Under rotational systems: Acreage	Percentage of (9) to (2)	AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED: Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,512	21,654	49.8	1,756	4.0	11,414	26 2	8,688	20.0	397	0.9	21,858	50.2
Malacca ...	122,271	73,069	59.8	2,141	1.8	15,217	12.4	31,844	26.0	2,063	1.7	49,202	40.2
Penang ...	2,501	1,382	55.3	331	13.2	728	29.1	60	2.4	36	1.4	1,119	44.7
Singapore ...	32,585	19,608	60.2	1,962	6.0	6,277	19.3	4,738	14.5	185	0.6	12,977	39.8
Total S.S. ...	200,869	115,713	57.6	6,190	3.1	33,636	16.7	45,330	22.6	2,681	1.3	85,156	42.4
F. M. S.—													
Perak ...	288,544	184,095	63.8	6,357	2.2	44,928	15.6	53,164	18.4	7,476	2.6	104,449	36.2
Selangor ...	328,573	227,396	69.2	3,827	1.2	37,043	11.3	60,307	18.3	6,648	2.0	101,177	30.8
Negri Sembilan ...	255,778	167,773	65.6	6,204	2.4	31,488	12.3	50,313	19.7	8,090	3.2	88,005	34.4
Pahang ...	85,870	56,297	65.6	2,924	3.4	16,991	19.8	9,658	11.2	7,012	8.2	29,573	34.4
Total F.M.S. ...	958,765	635,561	66.3	19,312	2.0	130,450	13.6	173,442	18.1	29,226	3.0	323,204	33.7
U. M. S.—													
Johore ...	475,258	333,398	70.2	6,114	1.3	64,500	13.5	71,246	15.0	33,659	7.1	141,860	29.8
Kedah ...	198,575	138,959	70.0	5,564	2.8	17,124	8.6	36,928	18.6	7,095	3.6	59,616	30.0
Kelantan ...	31,220	21,320	68.3	243	0.8	5,702	18.2	3,955	12.7	2,615	8.4	9,900	31.7
Trengganu (b) ...	4,817	3,178	66.0	nil	nil	74	1.5	1,565	32.5	74	1.5	1,639	34.0
Perlis (c) ...	1,371	858	62.6	216	15.8	257	18.7	40	2.9	84	6.1	513	37.4
Brunei ...	5,417	3,092	57.1	nil	nil	1,441	26.6	884	16.3	556	10.3	2,325	42.9
Total U.M.S. ...	716,658	500,805	69.9	12,137	1.7	89,098	12.4	114,618	16.0	44,083	6.2	215,853	30.1
Total MALAYA ...	1,876,292	1,252,079	66.7	37,639	2.0	253,184	13.5	333,390	17.8	75,990	4.1	624,213	33.3

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX FOR THE MONTH OF MARCH, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to March 1938		during the month		January to March 1938						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Mar. 1938	during the month	Jan. to Mar. 1938	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Mar. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	10,733	15,026	10,562	36,580	6,358	17,967	Nil	Nil	Nil	Nil	13,414	4,414	39,812	13,000	...	10,528	14,310	13	44
Johore ...	...	3,208	5,785	5,122	16,824	5,320	10,964	Nil	24	Nil	85	3,663	5,704	9,989	17,426	...	4,703	5,389	...	...
Kedah ...	...	377	3,984	2,575	9,229	767	2,926	Nil	Nil	Nil	Nil	2,000	1,760	6,203	6,138	...	298	3,645	...	...
Perlis ...	...	13	24	15	44	17	68	Nil	Nil	Nil	Nil	Nil	34	Nil	102	...	12	23	...	...
Kelantan ...	...	744	351	296	1,074	899	2,102	Nil	Nil	Nil	Nil	317	710	721	2,278	...	1,035	228	...	...
Trengganu ...	...	55	50	411	921	206	461	Nil	Nil	Nil	Nil	Nil	617	Nil	1,382	...	55	50	...	...
Brunei ...	...	18	71	46	162	97	228	...	...	...	...	...	163	...	396	...	Nil	69	...	...
Total Malay States	...	15,148	25,291	19,027	64,834	13,664	34,716	Nil	24	Nil	85	19,394	13,402	56,725	40,722	...	16,631	23,714	13	44
S. SETTLEMENTS :—																				
Malacca ...	...	2,465	1,299	1,054	3,711	1,029	1,936	Nil		Nil		3,244		7,730		...	2,444	1,433	...	...
Province Wellesley	...	2,641	822	309	1,323	325	743	Nil		Nil		5,781		24,918		...	3,244	727	...	...
Penang ...	2,215	6,182	10	17	64	201	334	2,102	13,540	7,232	42,213		Nil		Nil	2,817	6,212	10	...	...
Singapore ...	6,604	31,259	268	162	509	153	235	13,673		37,383		20,778		56,709		9,058	32,727	226	26	73
Labuan ...	...	46	Nil	Nil	Nil	31	50	38		150		Nil		Nil		...	44	Nil	...	...
Total Straits Settlements ...	8,819	42,593	2,399	1,542	5,607	1,739	3,298	15,813	13,540	44,765	42,213	29,803	Nil	89,357	Nil	11,875	44,671	2,396	26	73
Total Malaya ...	8,819	57,741	27,590	20,569	70,441	15,403	38,014	15,813	13,564	44,765	42,298	49,197	13,402	146,082	40,722	11,875	61,302	26,110	39	117

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	9,777	31,595	6,066	5,408	3,815	157
WET RUBBER	751	1,132	146	324	888	141
TOTAL ...	10,528	32,727	6,212	5,732	4,703	298

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Mar. 1938
29	30	31
Singapore ...	34,390	96,152
Penang ...	9,467	36,248
Port Swettenham.	5,165	13,190
Malacca ...	175	492
MALAYA ...	49,197	146,082

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Mar 1938
32	33	34
Malay States ...	32,728	95,185
Straits Settlements	2,653	8,360
MALAYA ...	35,381	105,545

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) − (2) − (3) − (4) − (5) − (9) − (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 23rd April, 1938

METEOROLOGICAL SUMMARY, MALAYA, MARCH, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	90.8	72.5	81.7	95	70	80	74	84.2	85.1	8.87	225.3	2.86	20	17	7	4		157.80	5.09	42
Bukit Jeram, Selangor ...	88.3	72.9	80.6	91	71	80	75	84.7	86.9	10.28	261.1	3.52	18	12	3			196.95	6.35	52
Sitiawan, Perak ...	89.2	73.8	81.5	92	72	84	77	84.5	84.8	5.18	131.6	1.29	20	15	3			204.00	6.58	55
Ipoh Aerodrome, Perak ...	90.3	72.8	81.5	94	69	82	75	83.4	84.3	10.43	264.9	2.38	15	14	8			170.55	5.50	46
Temerloh, Pahang ...	89.4	73.1	81.3	95	71	79	75	86.4	86.5	7.86	199.6	1.47	18	15	4	3		176.65	5.70	47
Kuala Lipis, Pahang ...	89.0	71.9	80.5	93	70	75	74	84.1	84.5	9.71	246.6	1.79	23	20	8	16		171.10	5.52	46
Kuala Pahang, Pahang ...	85.9	74.5	80.2	88	71	80	78	85.7	86.4	14.72	373.9	4.12	21	17	3			230.30	7.43	61
Kallang Aerodrome, S'pore ...	85.6	75.1	80.3	91	73	79	77	82.3	83.2	7.60	193.0	1.58	16	13	1			130.70	4.22	35
Bayan Lepas Aerodrome Penang ...	87.7	74.6	81.1	91	72	82	78	84.3	84.8	6.91	175.5	2.23	21	13	3			196.30	6.33	53
Bukit China, Malacca ...	86.2	73.9	80.1	91	72	83	76	84.4	85.5	10.00	254.0	3.29	17	14	7		1	188.80	6.09	50
Kluang, Johore ...	88.3	71.9	80.1	94	70	81	74	81.6	82.3	10.76	273.3	1.43	25	23	10	5		134.80	4.35	36
Bukit Lalang, Mersing, Johore	84.9	72.1	78.5	87	70	77	75	81.8	81.4	8.88	225.5	1.62	21	17	1			192.95	6.22	51
Alor Star, Kedah ...	89.8	73.0	81.4	95	70	80	75	84.6	85.9	6.57	166.9	1.74	22	18	3	1	2	195.40	6.30	52
Kota Bahru, Kelantan ...	87.8	72.7	80.3	92	69	76	75	83.1	83.7	19.46	494.3	7.30	17	14	2	1		219.20	7.07	59
Kuala Trengganu, Trengganu	86.2	72.9	79.5	90	70	77	75	83.0	83.6	21.41	543.8	11.17	15	14	1	1	1	240.45	7.76	64
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	72.9	62.5	67.7	79	60	64	64	71.7	71.9	12.48	317.0	4.07	29	25	5	22	1	117.75	3.80	31
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.1	56.5	64.8	76	49	66	63	69.7	69.7	10.98	278.9	1.74	27	24	3		1	128.05	4.13	34
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	72.8	59.4	66.1	77	53	68	62			10.31	261.9	1.88	27	24			1	145.15	4.68	39

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

JUNE, 1938.

EDITORIAL.

Guinea Grass As A Fodder

The provision of suitable fodder at an economic cost has constituted one of the more important limiting factors in cattle-keeping in Malaya. The common practice amongst the Indian cattle-keepers, who form the majority of those actively engaged in this industry, is to grass-feed their animals on such pasturage as may be found on the way-sides and on unoccupied land near the larger centres of population. Such pasturage is usually supplemented by stall-fed fresh grass and concentrated food.

The quantity of the cut grass is limited, and the pasturage is often of poor quality: so long as these remain the main foods there is little likelihood of any appreciable advance in this Malayan industry.

In recognition of this position, experiments were laid down some years ago at the Central Experiment Station, Serdang, to discover which of the known fodder grasses was suitable to local conditions. Of the large number of grasses tried, Guinea grass (*Panicum maximum*) was found to be the most suitable.

Although small test plots, grown under ideal conditions, were successful, it did not follow that the cultivation of this grass on a commercial scale, in situations such as were likely to obtain in practice, would be so successful as to justify the Department in recommending the grass for general cultivation. For this reason, the experiments which form the subject of the article in this number were carried out. These results, therefore, are of very practical value and for this reason it is pertinent to examine the conclusions reached.

On both "light" and "heavy" soils, the yield of grass decreases with the age of the grass "stools." It follows, therefore, that it is necessary to limit the frequency of grass-cutting, and every three to four years to replant the area after cultivation and manuring. Three-weekly cutting gives a higher annual yield than fortnightly, four-weekly a little more than three-weekly, but four, five and six-weekly cuttings all give a similar yield. Quality decreases with increasing interval but not greatly unless the interval exceeds four weeks. Thus four-weekly cuttings give maximum yield and a fair quality fodder.

Further experiments on the re-planting of areas with Guinea grass established the fact that cattle manure at the rate of from 10 to 15 tons per acre per annum is essential if even moderate yields are to be maintained.

Even with manuring, the yields of grass have been appreciably lower than those usually quoted for this grass, but they are sufficiently high to justify stall feeding with Guinea grass instead of pasturage. On the type of soil normally used for cattle keeping in Malaya stocking at the rate of 1½ cows to 2 cows per acre is a reasonable estimate if the area is planted with Guinea grass, whereas if the same area was used for pasturage several acres would be required to support one cow.

We have not, in this place, attempted to give more than a broad indication of the conclusions reached as a result of this work. The investigations have dealt with the subject from many angles, such as spacing of the plants, nutritive value of the grass under different conditions—of soil, age of plants, manuring and frequency of cutting. Such points as these are of importance and the detailed information given in the article will repay close study.

The value of fresh milk in the maintenance of health has of recent years been widely acknowledged and considerable propaganda has been directed to influence public opinion on this subject. The desirability of increasing the consumption of fresh milk in Malaya has perhaps been accorded less publicity, but the need is equally as great as elsewhere. The conclusions reached as a result of the experimental work, described in this place, should be of great value in any efforts made to increase the production in Malaya of fresh milk.

Original Articles.

EXPERIMENTS WITH GUINEA GRASS AT THE CENTRAL EXPERIMENT STATION, SERDANG.

Compiled from records of the Agricultural and Chemical Divisions.

Introductory.

The desirability of fodder grasses for cattle has long been recognized in Malaya. Comparative tests with a considerable number of fodder grasses were conducted early in the history of the Central Experiment Station, Serdang, and in 1924 it was stated that, of these, Guinea grass had been found to be the most desirable—yields of 40 tons per acre per annum were obtained on flat virgin soil. In the article quoted the desirability of choosing damp places was emphasized.*

Dairies should be situated as close to towns as possible, in order to reduce transport costs to the minimum, but it is now a difficult matter to find virgin land of any extent around the larger Malayan towns and still more difficult to find flat areas of such land. In 1932, the first of two experiments was therefore started at the Central Experiment Station, Serdang, to test productivity on cropped soil, not especially flat, nor especially damp.

This experiment was also designed to answer a number of other questions, of which the most important were those of necessary manurial applications and quality of grass.

Early high yields at Serdang were obtained by liberal use of cattle manure (of the order of 20 tons per acre per annum) but in practice, grass must be grown and be ready for cropping before a herd is established; unless a sufficient yield can be obtained without manure, artificial fertilizers must be employed to start the area, since purchase of cattle manure would be uneconomic in Malaya. Similarly, if an existing herd is to be appreciably enlarged, an extended area of fodder grass must be brought into cropping and application of cattle manure to either the new or old area, or to both, must be reduced from a high level during the process.

To test these points the trials included treatments with artificial fertilizers, of varying degrees of complexity and cost, and with cattle manure at the rate of 10,000 lbs. per acre (approximately 5 tons instead of the 10 or 20 tons which might normally be expected for a herd and area in being). Two further, but minor, considerations aided in the fixing of the application at 10,000 lbs: (a) this quantity contains phosphoric acid roughly equal in amount to that supplied by the fertilizer mixtures employed and (b) if reduced quantities of cattle manure were in practice found sufficient there would be (near towns) a highly profitable outlet for surplus manure for market gardening.

As quality, that is, nutritive value of fodder, is as important as quantity, arrangements were made for chemical analyses of the grass.†

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* *Malayan Agricultural Journal,* Vol. XII, p. 394.

† For details of sampling and analysis see Appendix A.

As interval of cutting may affect both quality and quantity, three frequencies were tested, cuttings being made at one week, fortnightly and three-weekly intervals.

Lay-out of Experimental Plots.

Since the inception of the experimental work in 1932 fertilizer applications and intervals of cutting have been varied, but the lay-out of the plots has remained unaltered as originally described in this Journal(1).

The lay-out is shown in Diagram 1 and provides for four replications of eight manurial treatments (including an unmanured control) on sub-plots of 1/60th acre each with different cutting frequencies. The total area under each manurial treatment is thus 1/15th acre.

The experiment was duplicated on 'heavy' and 'light' soils. These names are relative, as the former does not represent the truly heavy soils of Malaya.

Soil analyses are given in Table I; unfortunately analyses were not carried out in 1932 but in 1937. It is unlikely, however, that there have been any serious changes in physical composition or 'total' nutrients during the five-year period.

The 'heavy' area is slightly sloping, the slope running diagonally across the plot. The land had been planted with croton, *Croton Tiglium*, for 10 years. There had been some soil wash before the experiment started.

The 'light' area is flat and had originally (1923) been planted with limes, *Citrus medica* var. *acida*, but these made poor growth and were removed in 1929. Since then the area had been developed as rough pasture.

Both soils are poor in potash and the 'light' soil is exceptionally poor in phosphoric acid.

Planting and Cultivation.

The areas were enclosed with wire fencing and ploughed to a depth of 6 inches. Later, the ground was lightly cultivated and levelled to obtain an even surface for planting.

Both areas were planted in March, 1932, the stools of grass being spaced at intervals of 2 ft. x 2 ft., square planting.

In order to confine the manurial dressing applied to an individual plot the following precautions were taken:—

"Heavy" Soil. Owing to the land being on a slight slope, silts pits, 1 ft. wide and 1 ft. deep, were dug along the length of the series of plots, No. 8, No. 1, No. 4 and No. 8, bordering on the upper edge of the main path running through the area. No silt pit was dug, however, on the other side of the path, its place being taken by a guard row (see Diagram I).

The soil from the silt-pits is thrown back periodically on the slope above the row of pits.

"Light" Soil. In view of the flat nature of the area, silt-pits were considered unnecessary, guard rows running length-wise between each series of plots being substituted in all cases.

Table I.
Analysis of Soils under Experiment.

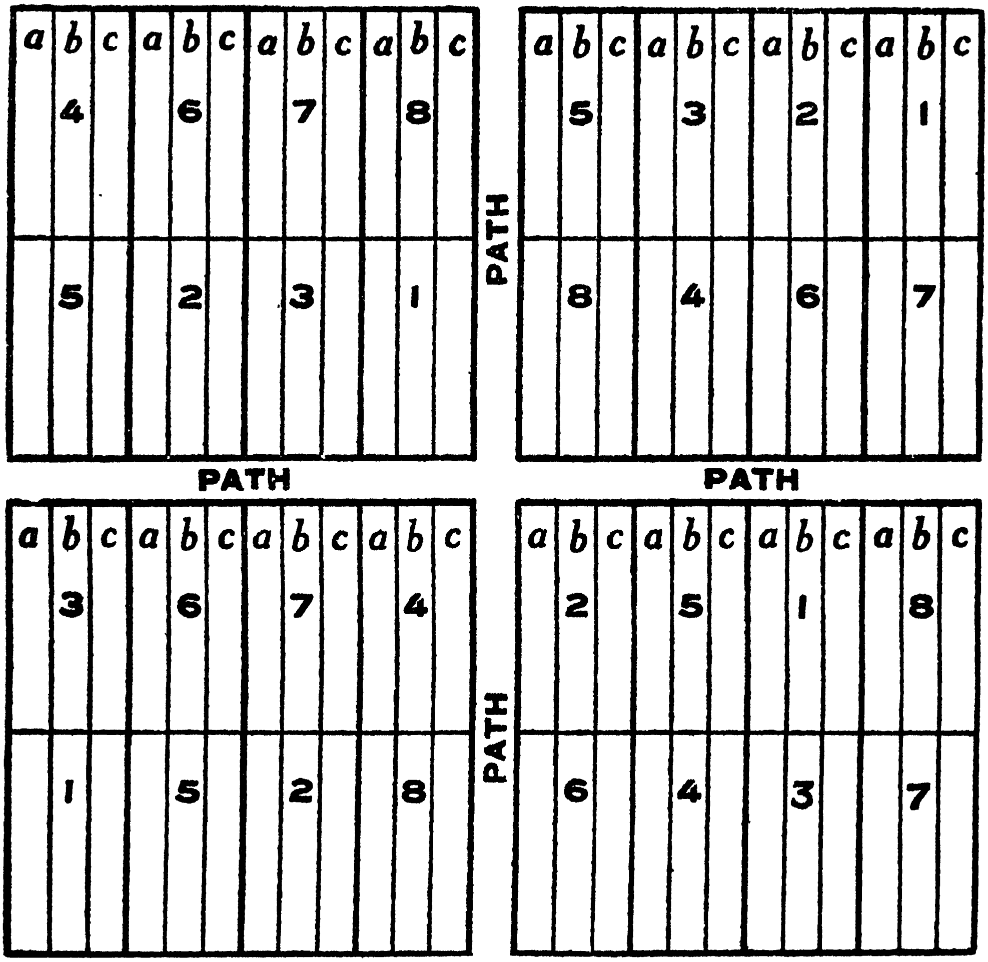
A. Physical Analysis.
Percentage Composition.

	Clay	Silt	Fine Sand	Coarse Sand	Gravel	Loss on Ignition	pH
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
Experiment I.							
"Heavy" Soil. Topsoil ...	48	9	29	14	Nil	9	4.8
Subsoil ...	43	10	37	10	Nil	9	4.8
"Light" Soil. Topsoil ...	11	9	46	31	1	3	5.0
Subsoil ...	14	6	46	30	1	3	5.2
Experiment II.							
Topsoil ...	46	14	30	8	Nil	9	4.8
Subsoil ...	40	16	33	11	Nil	7	4.8

B. Chemical Analysis.
Percentage Composition.

	Nitrogen	CaO	Fe_2O_3, Al_2O_3	K_2O	P_2O_5
	per cent.	per cent.	per cent.	per cent.	per cent.
Experiment I.					
"Heavy" Soil. Topsoil ...	0.086	0.030	19.8	0.166	0.022
Subsoil ...	0.078	0.032	21.0	0.208	0.020
"Light" Soil. Topsoil ...	0.091	0.039	5.4	0.061	0.006
Subsoil ...	0.050	0.044	5.5	0.089	0.009
Experiment II.					
Topsoil ...	0.120	0.089	14.0	0.294	0.033
Subsoil ...	0.081	0.056	16.3	0.343	0.024

DIAGRAM I.
Arrangement of Plots in Manurial Experiment with Guinea Grass.



Notes: 1. The numbers of the plots correspond to the different manurial treatments.

2. Each plot is trisected into three sub-plots, lettered "a", "b" and "c" respectively. These were cut at different intervals.

3. In the first phase the cutting programme was as follows :—
   (a) Sub-plots lettered "a" were cut weekly, then monthly and finally three-weekly.
   (b) Sub-plots lettered "b" were cut fortnightly.
   (c) Sub-plots lettered "c" were cut three-weekly.

4. In the second phase the cutting programme was as follows :—
   (a) Sub-plots lettered "a" were cut four-weekly.
   (b) Sub-plots lettered "b" were cut five-weekly.
   (c) Sub-plots lettered "c" were cut six-weekly.

All the plots were weeded periodically with a changkol (hoe) to a depth of about ½ inch; no inter-row cultivation was given. The experiment was conducted in two phases, to test shorter and longer intervals of cutting.

First Phase. Shorter Intervals of Cutting.

Manurial treatments employed are given in Table II. Malayan inland soils are known to be especially deficient in, and to respond to, phosphoric acid; this nutrient was therefore used in all the treatments with artificial fertilizer.

Both 'acid' and 'basic' treatments were employed, because considerable differences of response to the two classes of fertilizer by annual crops had been found on similar soils.

Cutting was started in December, 1932 and continued until June, 1934. Cutting intervals on the "a" sub-plots were, however, twice changed, weekly cuttings being employed from December, 1932 to March, 1933, monthly from April, 1933 to September, 1933 and three-weekly from September, 1933 to June, 1934, with a change of manurial treatments for the last period. These changes were exploratory in character and revealed no differences of importance in composition from the sub-plots cut less frequently. Weekly cutting proved to be far too severe and yielded less than half the grass harvested from the "b" and "c" sub-plots, which were cut at fortnightly and three-weekly intervals respectively.

On the "b" and "c" sub-plots cutting intervals were maintained unchanged and there was only one minor change of manurial treatment; it is proposed, therefore, to give results from these plots only and to discard those from the "a" sub-plots on which there was lack of continuity.

A. Yields of Grass.

The figures for the average yields of grass on the two types of soil for three periods cut at fortnightly and three-weekly intervals are shown in Table III, Parts I and II respectively.* Figures for May and June, 1933, have been omitted. In the former month there were errors of omission of cutting which may have affected yields in June. Part I of the table gives the figures for the grass on the 'heavy' soil, Part II those for the 'light' soil. The figures have been calculated in lbs. of grass per acre per day.

The most striking feature of these yields is the rapid fall from the moderate standard attained on manured plots in the first six months, and the fact that the second application of manure had no beneficial action on the grass. Assuming that 45 lbs. of grass per day is needed for one cow, indications are that allowance must be made for 1 acre per cow on 'heavy' soil and about 1½ acres per cow on 'light' soil, if the grass is to be cut fortnightly or three-weekly.

* It will be noticed that mean yields for the 18 months' period have not been given. In view of the large differences between the first and the two later periods, it is felt that general means would be misleading and meaningless.

Table II.
Manurial Treatments for Guinea Grass at Serdang.
Experiment I, First Phase.

Serial No.	Details of Manure	Rate of Application (lbs. per acre per annum)[1]			
		July — August 1932 "Heavy" and "Light" Soil.	August 1933. "Heavy" Soil[2]	August 1933. "Light" Soil[2]	
1	Basic slag ...	750 (120 lbs. P_2O_5)	As in July-August 1932, except that nitrogenous fertilizers were applied in three equal parts at four-monthly intervals. The first application was made in August 1933.	750 (120 lbs. P_2O_5)	Nitrogenous fertilizers were applied in instalments as on "heavy" soil.
2	Superphosphate of lime ...	750 (120 lbs. P_2O_5)		750 (120 lbs. P_2O_5)	
3	Calcium cyanamide ... Basic slag ...	210 (40 lbs. N) 750 (120 lbs. P_2O_5)		262.5 (50 lbs. N) 750 (120 lbs. P_2O_5)	
4	Sulphate of ammonia ... Superphosphate of lime ...	200 (40 lbs. N) 750 (120 lbs. P_2O_5)		250 (50 lbs. N) 750 (120 lbs. P_2O_5)	
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	210 (40 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)		262.5 (50 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)	
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	200 (40 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)		250 (50 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)	
7	Cattle manure ...	10,000 (67 lbs. N) (120 lbs. P_2O_5) (32 lbs. K_2O)		12,500 (84 lbs. N) (150 lbs. P_2O_5) (40 lbs. K_2O)	
8	Control ...	No manure.		No manure.	

[1]The approximate amounts of nitrogen (N), phosphoric acid (P_2O_5) and potash (K_2O) corresponding to the different amounts of fertilizers are shown in brackets.

[2]These applications were made only to "b" and "c" sub-plots; "a" sub-plots received different treatment, but the yields from the plots have been disregarded in this paper.

Turning to details it will be noticed that—

(i) There has been a different degree of response to the two intervals of cutting on the two areas, the longer interval having given significantly better yields on the 'heavy' soil, while on the 'light' soil the difference though consistently in the same direction is too small to be statistically significant.

Table III, Part I

"Heavy" Soil.

Average Yields of Guinea Grass at Serdang cut at fortnightly and three-weekly intervals, December 1932 to June, 1934.

(Results calculated in lbs. of grass per acre per day.)

Serial No.	Manurial Treatment	First period Dec. 1932-Ap. 1933		Second period July-Dec. 1933		Third period Jan.-June 1934	
		Fort-nightly interval	Three-weekly interval	Fort-nightly interval	Three-weekly interval	Fort-nightly interval	Three-weekly interval
1	Basic slag ...	116	135	45	56	39	48
2	Superphosphate of lime ...	66	90	51	65	52	60
3	Calcium cyanamide ... Basic slag ...	116	116	44	58	37	46
4	Sulphate of ammonia . Superphosphate of lime ...	101	118	46	65	38	51
5	Calcium cyanamide ... Basic slag .. Sulphate of potash . .	116	126	55	68	47	52
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	113	142	64	68	54	61
7	Cattle manure ...	96	110	47	44	40	45
8	Control ...	68	82	31	42	22	30
	Means ...	99	115	47	58	41	49
		107		53		45	
	Significant Difference for mean of Cuttings (9:1)	9		4		4	
	(19:1)	10		5		5	
	Significant Difference for Manurial Treatments' 'within' Cuttings (9:1)	24		12		10	
	(19:1)	30		15		13	

Table III, Part II.

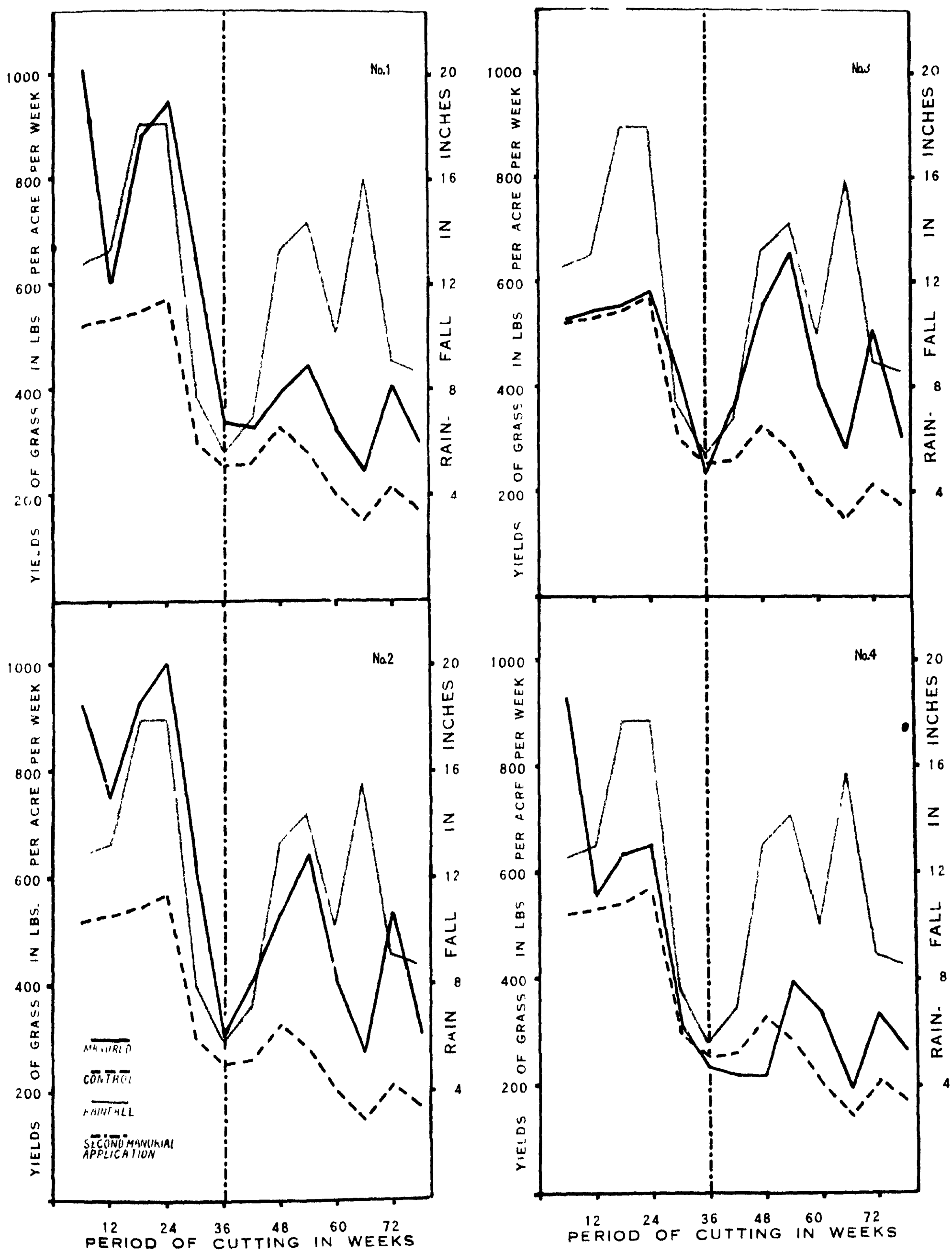
"Light" Soil.

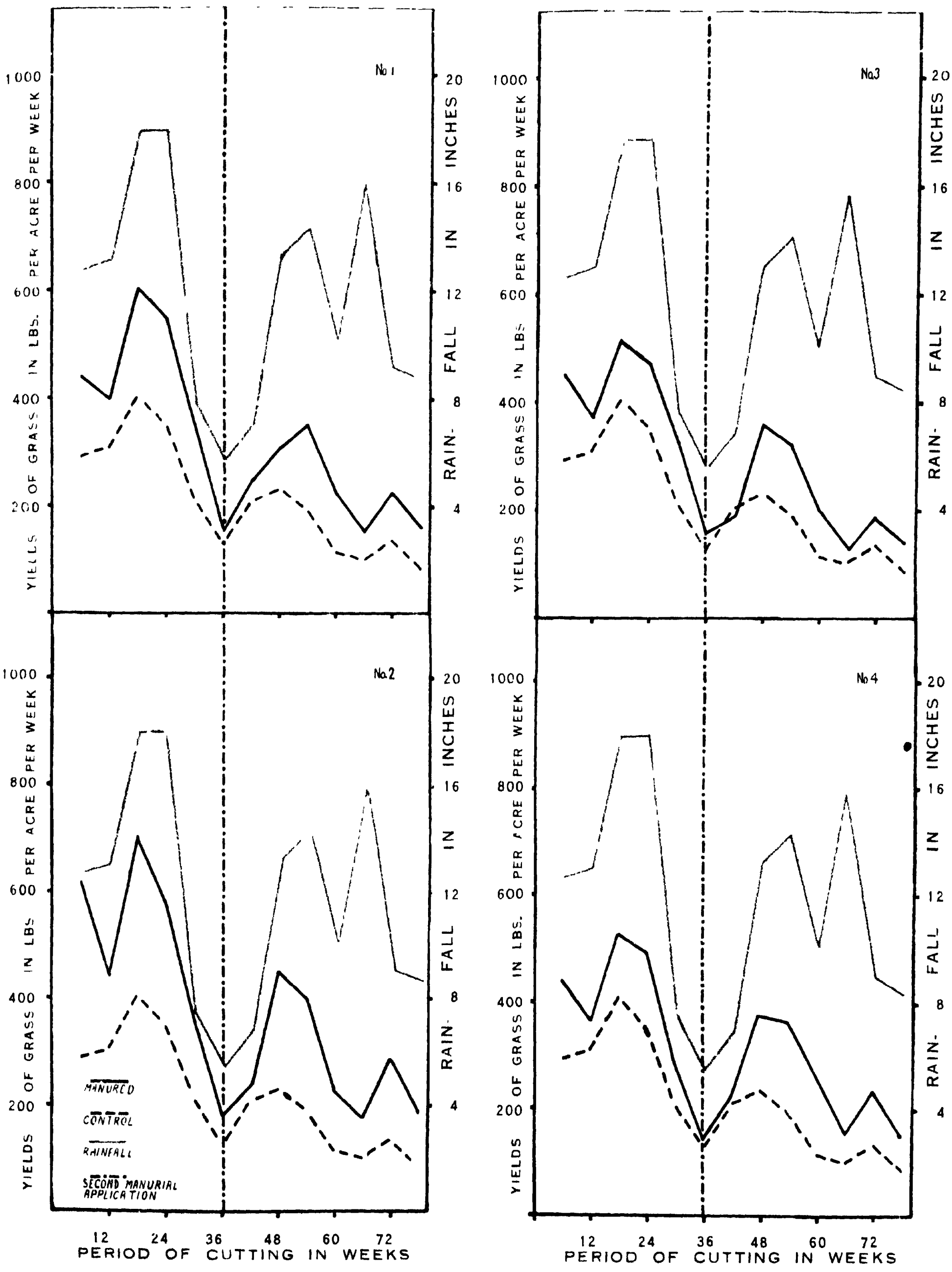
Average Yields of Guinea Grass at Serdang cut at fortnightly and three-weekly intervals, December 1932 to April 1934.

(Results calculated in lbs. of grass per acre per day)

Serial No.	Manurial Treatment	First period Dec. 1932-Ap. 1933		Second period July-Dec. 1933		Third period Jan.-June 1934	
		Fort-nightly interval	Three-weekly interval	Fort-nightly interval	Three-weekly interval	Fort-nightly interval	Three-weekly interval
1	Basic slag ...	67	72	39	39	29	30
2	Superphosphate of lime ...	62	69	42	39	29	26
3	Calcium cyanamide ... Basic slag ...	69	82	41	47	33	33
4	Sulphate of ammonia ... Superphosphate of lime ...	60	65	44	41	28	30
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	72	83	48	44	37	36
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	75	91	54	47	38	35
7	Cattle manure ...	69	68	41	41	36	32
8	Control ...	45	51	24	32	19	17
	Means ...	65	73	42	41	31	30
		69		42		30	
	Significant Difference for mean of Cuttings (10 . 1) (20 ·1)	8 10		Obviously no significant difference.		Obviously no significant difference.	
	Significant Difference for Manurial Treatments 'within' Cuttings (10 ·1) (20 :1)	13 18		8 12		6 8	

(ii) On both soils there was significant response to all manuring, except for the curious case of superphosphate of lime on the 'heavy' soil during the first six months. Phosphoric acid was clearly essential, but the addition of nitrogen (Treatments 3 and 4) produced no additional yield. It is impossible to say whether


No.1
No.3
No.2
No.4
1000
800
600
400
200
20
16
12
8
4
YIELDS OF GRASS IN LBS PER ACRE PER WEEK
RAIN-FALL IN INCHES
MANURED
CONTROL
RAINFALL
SECOND MANURIAL APPLICATION
12
24
36
48
60
72
PERIOD OF CUTTING IN WEEKS


No 1
No 2
No 3
No 4
YIELDS OF GRASS IN LBS. PER ACRE PER WEEK
RAIN-FALL IN INCHES
1000
800
600
400
200
20
16
12
8
4
MANURED
CONTROL
RAINFALL
SECOND MANURIAL APPLICATION
12 24 36 48 60 72
PERIOD OF CUTTING IN WEEKS

the significantly high yields of the complete mixtures, No. 6 on the 'heavy' soil and Nos. 5 and 6 on the 'light' soil, would have been produced in the absence of nitrogen, but it is clear that the increased yields although significant are not sufficiently great to render the relatively expensive nitrogenous and potassic manures economic.

Cattle manure in the quantity applied in the earlier stages of the experiment was definitely inferior to some of the inorganic mixtures and clearly has no specific effect on Guinea grass in these areas.

B. Effect of Rainfall on Yields of Grass.

The influence of rainfall on yield is illustrated graphically in Plates I and II, in which the average yields for three-weekly cuttings and certain manurial treatments on both types of soil have been plotted against rainfall for six-weekly periods.

There is a fairly close correlation for both types of soil between yield and rainfall in the early stages of the experiment, but this becomes less marked in later stages.

C. Quality of Grass.

The quality of the grass will be considered in relation to each constituent.

(a) *Moisture.*—The moisture content tended to vary slightly with the prevailing weather, also with the age of the stools. When cutting started (December, 1932) the moisture content of the grass was approximately 79 per cent. During the dry season (June-August, 1933) the figure fell to about 75 per cent., increasing to about 77 per cent. with the next wet season (October-December, 1933). There is still, however, a diminution of 2 per cent. compared with the original figure.

There were no marked differences between the moisture content figures for grass cut at either fortnightly or three-weekly intervals, while the type of soil was also apparently without effect in this respect.

(b) *Crude Protein.*—The results of the determinations may be summarized as follows:—

(i) Manurial treatment has little effect, if any, on the crude protein content of the grass on either type of soil. Table IV shows the range of variation obtained with one series of samples for one three-monthly cutting period, including both intervals of cutting on the two types of soil.

The figures indicate that the crude protein contents are of the same order for the fortnightly cutting on both types of soil and the three-weekly cutting on the 'heavy' soil. The range of figures for the grass on the 'light' soil cut at three-weekly intervals is, however, much lower.

(ii) Table V illustrates the tendency for the protein content to decrease with an increase in age of stools. This tendency is particularly marked with the grass having a high initial crude protein content, for example, the grass cut at fortnightly

intervals on both types of soil and at three-weekly intervals on the 'heavy' soil. Further, the crude protein content does not increase following the application of a manurial dressing.

(c) *Crude Fibre.*—The results of analysis indicate that neither the manurial treatment nor the type of soil has any significant effect on the crude fibre content of the grass. There is, however, a tendency for the crude fibre content to increase slightly with an increase in the interval of cutting. Figures for one series of samples for one three-monthly cutting period, including both types of soil and intervals of cutting, are given in Table VI.

There was no tendency for the crude fibre content to vary with an increase in the age of the stools.

Table IV.

Variations in Crude Protein Content of Guinea Grass with Different Manurial Treatments.

(Moisture-free basis.)

Serial No.	Details of Manurial Treatment.	Fortnightly Cutting		Three-Weekly Cutting	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent.	per cent.	per cent.	per cent.
1	Basic slag ...	18.0	16.3	16.6	12.2
2	Superphosphate of lime ...	14.5	17.1	15.2	12.0
3	Calcium cyanamide ... Basic slag ...	17.2	16.8	17.0	12.2
4	Sulphate of ammonia ... Superphosphate of lime ...	15.4	16.5	16.5	12.7
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	18.1	17.4	15.9	12.7
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	16.2	16.5	15.4	13.6
7	Cattle manure ...	16.5	16.4	16.1	13.7
8	Control ...	15.7	18.0	15.1	12.6
	Maximum ...	18.1	18.0	17.0	13.7
	Minimum ...	14.5	16.3	15.1	12.0
	Average ...	16.5	16.9	16.0	12.7

Table V.

Decrease in Crude Protein Content of Guinea Grass with Increase in Age of Stools.

(Moisture-free basis.)

Serial No. of Three-Monthly Cutting Period.	Fortnightly Cutting.		Three-Weekly Cutting.	
	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
	per cent.	per cent.	per cent.	per cent.
1 ...	16.5	16.9	16.0	12.7
2 ...	14.4	13.5	12.7	12.1
3* ...	14.1	13.0	13.2	11.6
4 ...	12.5	12.4	12.3	11.5

* Manure applied during this cutting period.

Table VI.

Variations in Crude Fibre Content of Guinea Grass with Different Manurial Treatments.

(Moisture-free basis.)

Serial No.	Details of Manurial Treatment	Fortnightly Cutting		Three-Weekly Cutting	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent	per cent.	per cent.	per cent.
1	Basic slag ...	25.2	27.8	28.3	28.1
2	Superphosphate of lime ...	25.1	30.3	28.7	29.8
3	Calcium cyanamide ... Basic slag ...	25.6	28.2	28.3	27.3
4	Sulphate of ammonia ... Superphosphate of lime ..	25.4	26.2	30.7	29.8
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	28.4	27.5	30.5	25.7
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	29.1	28.5	30 0	30 0
7	Cattle manure ...	28.3	27.3	29.0	28.9
8	Control ...	26.1	27.4	27.7	28.8
	Maximum ...	29.1	30.3	30.7	30.0
	Minimum ...	25.1	26.2	27.7	25.7
	Average ...	26.7	27.9	29.2	28.6

Table VII.

Variations in Calcium Content of Guinea Grass with Different Manurial Treatments.

(Results calculated as calcium oxide (CaO) on a moisture-free basis.)

Serial No.	Details of Manurial Treatment.	Fortnightly Cutting		Three-Weekly Cutting	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent	per cent.	per cent.	per cent.
1	Basic slag ...	0.71	0.93	0.63	0.92
2	Superphosphate of lime ...	0.22	0.68	0.17	0.71
3	Calcium cyanamide ... Basic slag ...	0.71	1.07	0.75	1.05
4	Sulphate of ammonia ... Superphosphate of lime ...	0.42	0.66	0.46	0.64
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	0.62	0.99	0.65	0.92
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	0.41	0.55	0.44	0.53
7	Cattle manure ..	0.36	0.28	0.34	0.26
8	Control ...	0.28	0.28	0.30	0.21

(d) *Calcium*.—Table VII gives the results for the first three-monthly cutting period in respect of the calcium content of the grass in relation to the different manurial treatments and the two intervals of cutting on the two types of soil.

The following conclusions may be drawn:—

(i) Cattle manure in the quantity applied is much less effective than artificial fertilizers.

(ii) Apart from cattle manure on both types of soil and superphosphate of lime on 'heavy' soil, the effect of each manurial treatment is more marked with the 'light' than with the 'heavy' soil.

(iii) The addition of superphosphate of lime to the 'heavy' soil has a depressing effect.

(iv) Calcium applied in the form of a 'basic' manure has a more marked effect than in an 'acid' manure.

(v) The calcium content of the grass does not appear to be affected by an increase in the interval of cutting.

There was no marked tendency for the calcium content to vary with an increase in the age of stools. Table VIII shows the results obtained on both types of soil with the complete 'basic' mixture (No. 5) for a three-weekly interval of cutting over successive three-monthly periods.

It will be noticed that the calcium content does not increase following the application of the manurial dressing.

Table VIII

Variation in Calcium Content of Guinea Grass with Increase in Age of Stools (Manurial Treatment No. 5).

(Results calculated as calcium oxide (CaO) on a moisture-free basis.)

Serial No. of Three-Monthly Cutting Period	Three-Weekly Cutting. "Heavy" Soil	Three-Weekly Cutting. "Light" Soil
	per cent.	per cent.
1 ...	0.65	0.92
2 ...	0.70	1.90
3* ...	0.71	1.09
4 ...	0.60	0.94

* Manure applied during this cutting period.

The only treatment in which there was a definite increase in the calcium content of the grass was that of superphosphate of lime on the 'heavy' soil as the figures in Table IX show. The resultant calcium content of the grass is still, however, very low.

Table IX.

Increase in Calcium Content of Guinea Grass following Application of Superphosphate of Lime.

(Results calculated as calcium oxide (CaO) on a moisture-free basis.)

Serial No. of Three-Monthly Cutting Period	"Heavy" Soil Fortnightly Cutting	"Heavy" Soil Three-Weekly Cutting.
	per cent.	per cent.
2 ...	0.18	0.16
3* ...	0.21	0.31
4 ...	0.29	0.33

* Manure applied during this cutting period.

Table X.

Variations in Phosphorus Content of Guinea Grass with Different Manurial Treatments.

(Results calculated as phosphoric acid (P_2O_5) on a moisture-free basis)

Serial No.	Details of Manurial Treatment.	Fortnightly Cutting		Three-Weekly Cutting.	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent	per cent.	per cent.	per cent.
1	Basic slag ...	0.52	0.87	0.44	0.75
2	Superphosphate of lime ...	0.27	0.85	0.27	0.82
3	Calcium cyanamide ... Basic slag ...	0.50	0.78	0.47	0.73
4	Sulphate of ammonia ... Superphosphate of lime ...	0.43	0.79	0.42	0.74
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	0.49	0.82	0.45	0.72
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	0.44	0.72	0.43	0.68
7	Cattle manure ...	0.42	0.46	0.38	0.42
8	Control ...	0.31	0.38	0.30	0.31

(e) *Phosphorus.*—The results of analysis for the first three-monthly cutting period in respect of the phosphorus content of the grass in relation to the different manurial treatments and the two intervals of cutting on the two types of soil are shown in Table X.

The following conclusions may be drawn:—

(i) Cattle manure on the 'light' soil in the quantity applied is much less effective than artificial fertilizers.

(ii) Apart from cattle manure and superphosphate of lime on the 'heavy' soil the effect of any particular manurial treatment is more marked with the 'light' than with the 'heavy' soil.

(iii) The depressing effect of the addition of superphosphate of lime to the 'heavy' soil is most noticeable.

(iv) The figures indicate a tendency for the phosphorus content to diminish with an increase in the interval of cutting.

While there was no tendency for the phosphorus content to vary with an increase in the age of the stools the results of analysis indicated a slight increase following the application of a manurial dressing. Table XI shows the results obtained on both types of soil with the complete 'basic' mixture (No. 5) for a three-weekly interval of cutting over successive three-monthly periods.

Table XI.

Variations in Phosphorus Content of Guinea Grass with Increase in Age of Stools (Manural Treatment No. 5).

(Results calculated as phosphoric acid (P_2O_5) on a moisture-free basis)

Serial No. of Three-Monthly Cutting Period.	Three-Weekly Cutting.	
	"Heavy" Soil	"Light" Soil
	per cent.	per cent.
1 ...	0.45	0.72
2 ...	0 48	0 81
3* ...	0 48	0 79
4 ...	0 72	0.90

* Manure applied during this cutting period.

The results of the various determinations may be summarized therefore as follows:—

(i) Manurial treatment has little or no effect on the crude protein content of the grass.

(ii) The crude protein content of the grass tends to decrease with an increase in the age of the stools. The high initial figure is not regained as a result of applications of fertilizers in the quantities used in the experiment.

(iii) As regards increases in both calcium and phosphorus the grass on the 'light' soil responded better to manurial treatment than that on the 'heavy' soil.

(iv) During the initial stages of cutting the depressing effect of superphosphate of lime on the 'heavy' soil in respect of both calcium and phosphorus contents is most noticeable.

(v) 'Basic' manures tend to yield a grass with a higher calcium content than 'acid' manures.

(vi) The phosphorus content shows a tendency to decrease with an increase in interval of cutting and to increase following the application of a manurial dressing.

Table XII, Part I.

"Heavy" Soil.

Average Yields of Guinea Grass at Serdang cut at Four-Weekly, Five-Weekly and Six-Weekly Intervals, November 1935 to July 1936.

(Results calculated in lbs. of grass per acre per day)

Serial No.	Manurial Treatment.	Four-Weekly Interval.	Five-Weekly Interval.	Six-Weekly Interval.	Mean
1	Basic slag ...	62	67	74	68
2	Superphosphate of lime ...	62	60	67	63
3	Calcium cyanamide ... Basic slag ...	65	61	61	62
4	Sulphate of ammonia ... Superphosphate of lime ...	63	66	67	65
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	83	77	82	81
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	80	80	85	82
7	Cattle manure ...	65	79	73	72
8	Control ...	62	57	57	59
	Means ...	68	68	71	
			69		
Significant Difference for Cutting	(9:1) (19:1)		5.5 5.9		
Significant Difference for Manurial Treatment —Means.	(9:1) (19:1)		12.6 15.9		
Significant Difference for Manurial Treatments 'within' Cuttings	(9:1) (19:1)		15.4 19.6		

Table XII, Part II.

"Light" Soil.

Average Yields of Guinea Grass at Serdang cut at Four-Weekly, Five-Weekly and Six-Weekly Intervals, November 1935 to July 1936.

(Results calculated in lbs. of grass per acre per day)

Serial No.	Manurial Treatment.	Four-Weekly Interval.	Five-Weekly Interval.	Six-Weekly Interval.	Mean
1	Basic slag ...	50	47	48	48
2	Superphosphate of lime ...	52	48	47	49
3	Calcium cyanamide ... Basic slag ...	52	50	50	51
4	Sulphate of ammonia ... Superphosphate of lime ...	62	60	54	59
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	69	75	68	71
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	77	77	81	78
7	Cattle manure ...	59	56	56	57
8	Control ...	44	44	43	44
	Means ...	58	57	56	
			57		
Significant Difference* for Cutting (9:1) (19:1)			2.9 3.4		
Significant Difference for Manurial Treatment —Means (9:1) (19:1)			8.1 10.1		
Significant Difference (10:1) for Manurial Treatments 'within' Cuttings (9:1) (19:1)			12.2 14.2		

* See Appendix B.

General.

The marked diminution in yield of grass during the third six months pointed to the advisability of resting the plots to enable the grass to become more vigorous.

Cutting was therefore stopped and attention restricted to merely regular weeding.

There was, however, no marked improvement as a result of the resting period of six months. The foliage of the grass was yellowish-green in colour, and a fair proportion of the stools were dying in the centre.

It was decided, therefore, to replant both areas, thereby starting the second phase of the experiment.

Second Phase. Longer Intervals of Cutting.

In November, 1934, the stools of grass from the first phase were lifted and the land was thoroughly cultivated to a depth of 10 inches.

Cattle manure was applied to all plots at the rate of 10 tons per acre and the area replanted towards the end of January, 1935.

Stools were spaced 3ft. x 3ft., square planting, instead of 2 ft. x 2 ft. as in the first phase, since it was thought that the latter planting system might have been too close for optimum development.

Owing to the wider planting and a change in disposition of guard rows, the number of stools in each sub-plot was reduced to 60, making a total of 240 stools with the four replications. Based on the planting distance, this number of stools corresponds to 1/22nd of an acre.

Manures were applied six months after replanting and were as in the second application in the first phase, *vide* Table II, except that Treatment 7 on 'light' soil consisted of 10,000 lbs. instead of 12,500 lbs. of cattle manure.

Commencing in March, 1935, approximately two months after the completion of replanting, the grass was cut at intervals of about 6 weeks as a preliminary to the regular cutting which started in November, 1935.

The intervals of cutting were as follows:—

'a' sub-plots — four weeks
'b' sub-plots — five weeks
'c' sub-plots — six weeks.

A. Yields of Grass.

The figures for the average yields of grass on the two types of soil for the period November, 1935 to July, 1936, cut at the three intervals mentioned above are shown in Table XII, Parts I and II respectively. Part I of the table gives the figures for the grass on the 'heavy' soil, Part II those for the 'light' soil. The figures have been calculated in lbs. of grass per acre per day.

It will be seen that in spite of cultivation, replanting, basal manuring at replanting and longer intervals of cutting, yields of grass are still low and indicate the need of 2/3 to 3/4 acre per cow.

The least promising feature of the results is the relatively poor showing of Treatment No. 7, where in all nearly 15 tons of cattle manure were applied. The superiority of the complete mixtures is again evident and this is especially marked on the 'light' soil area.

There are no differences remotely approaching significance between yields at different intervals of cutting.

B. Quality of Grass.

Similarly to the first phase, the quality of the grass will be considered in relation to each constituent, comparisons between the results obtained in both phases being also included.

(a) *Moisture.*—The results confirmed those obtained in the first phase in respect of a variation in moisture content with prevailing weather and age of stools. Thus, in the case of the grass on the 'heavy' soil cut at four-weekly intervals, when cutting started in November, 1935, the average moisture content was about 78.5 per cent. During the short dry season (February-March, 1936) the figure fell to about 77 per cent., increasing during the next short wet season (April, 1936) to about 77.5 per cent. This is about 1 per cent. less than the original figure.

Contrary to the first phase, the results showed a slight tendency for the moisture content to decrease with increasing interval of cutting. This applies to both types of soil as the figures given in Table XIII, covering the first six months of the second phase, show:—

Table XIII.

Decrease in Moisture Content of Guinea Grass with Increasing Interval of Cutting.

Type of Soil.	Four-Weekly Cutting	Five-Weekly Cutting	Six-Weekly Cutting.
	per cent.	per cent.	per cent.
"Heavy" Soil...	77.6	76.3	76.0
"Light" Soil ...	76.0	74.8	74.5

(b) *Crude Protein.*—The results may be summarized as follows:—

(i) As in the first phase, manurial treatment has little effect, if any, on the crude protein content of the grass on either type of soil. Table XIV shows the range of variation obtained with one series of samples for one three-monthly cutting period, including the three-intervals of cutting on the two types of soil.

(ii) Contrary to the first phase, the figures in Table XIV show for the same interval of cutting a slightly higher range for the 'light' soil than for the 'heavy' soil.

(iii) The tendency for the crude protein content to decrease with increase in interval of cutting is confirmed.

(iv) Compared with the first phase, the figures in Table XV show only a very slight tendency for the crude protein content to decrease with an increase in the age of the stools. Doubtless this reduced tendency can be correlated with a comparatively low initial figure for the crude protein.

Table XIV.

Variations in Crude Protein Content of Guinea Grass with Different Manurial Treatments.

(Moisture-free basis)

Serial No.	Details of Manurial Treatment.	Four-Weekly Cutting. "Heavy" Soil	Four-Weekly Cutting. "Light" Soil	Five-Weekly Cutting. "Heavy" Soil	Five-Weekly Cutting. "Light" Soil	Six-Weekly Cutting. "Heavy" Soil	Six-Weekly Cutting. "Light" Soil
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1	Basic slag ...	12.3	11.6	10.2	10.6	10.4	11.1
2	Superphosphate of lime ...	10.8	11.8	10.0	10.5	8.9	9.7
3	Calcium cyanamide ... Basic slag ...	12.3	11.8	10.4	11.4	10.7	12.0
4	Sulphate of ammonia ... Superphosphate of lime ...	11.3	12.0	10.8	10.7	10.1	10.4
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	11.8	11.7	9.8	10.9	9.9	10.6
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	10.9	12.2	9.3	11.0	9.4	10.1
7	Cattle manure ...	11.6	12.4	10.8	10.7	10.0	10.1
8	Control ...	12.3	11.9	10.9	11.1	9.8	10.3
	Maximum ...	12.3	12.4	10.9	11.4	10.7	12.0
	Minimum ...	10.8	11.6	9.3	10.5	8.9	9.7
	Average ...	11.7	11.9	10.4	10.9	9.9	10.5

Table XV.

Decrease in Crude Protein Content with Increase in Age of Stools.

(Moisture-free basis)

Serial No. of Three- Monthly Cutting Period.	Four-Weekly Cutting.		Five-Weekly Cutting.		Six-Weekly Cutting.	
	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	11.7	11.9	10.4	10.9	9.9	10.5
2 ...	12.1	12.3	10.5	11.4	9.5	10.4
3 ...	10.2	11.6	9.1	10.0	9.3	9.7

Table XVI.

Varations in Crude Fibre Content of Guinea Grass with Different Manurial Treatments.

(Moisture-free basis)

Serial No.	Details of Manurial Treatment.	Four-Weekly Cutting.		Five-Weekly Cutting.		Six-Weekly Cutting.	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent
1	Basic slag ...	30.1	30.8	29.5	31.4	31.4	29.9
2	Superphosphate of lime ..	31.2	30.5	31.8	29.9	30.2	32.8
3	Calcium cyanamide ... Basic slag ...	29.4	31.2	28.4	32.5	31.8	30.8
4	Sulphate of ammonia ... Superphosphate of lime ..	30.4	30.8	32.6	29.7	30.2	32.3
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ..	30.0	30.4	28.9	32.5	31.7	31.4
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	30.8	31.8	32.0	30.4	30.6	31.1
7	Cattle manure ...	30.3	31.2	29.6	32.4	30.7	31.4
8	Control ...	31.2	31.0	31.6	29.0	32.1	32.4
	Maximum ...	31.2	31.8	32.6	32.5	32.1	32.8
	Minimum ...	29.4	30.4	28.4	29.0	30.2	29.9
	Average ...	30.4	31.0	30.6	31.0	31.1	31.5

(c) *Crude Fibre.*—The results of analysis confirm those obtained in the first phase in respect of the absence of any correlation between manurial treatment, type of soil and crude fibre content.

The tendency for the crude fibre content to increase slightly with an increase in the interval of cutting is again noticeable.

Figures for one series of samples for one three-monthly cutting period, including both types of soil and the three intervals of cutting, are given in Table XVI.

As far as could be ascertained, there was no tendency for the crude fibre content to vary with an increase in the age of the stools.

As regards the gradual increase of crude fibre content with increase in interval of cutting, the results in Table XVII, in which the average figures obtained in both phases are given, are of interest.

Table XVII.

Increase in Crude Fibre Content of Guinea Grass with Increasing Interval of Cutting.

(Moisture-free basis)

Interval of Cutting.	"Heavy" Soil	"Light" Soil
weeks	per cent.	per cent.
2 ...	26.7	27.9
3 ...	29.2	28.6
4 ...	30.4	31.0
5 ...	30 6	31.0
6 ...	31.1	31.5

(d) *Calcium.*—Table XVIII gives the results for the first three-monthly cutting period in respect of the calcium content of the grass in relation to the different manurial treatments and the three intervals of cutting on the two types of soil.

Although the figures in a few instances are somewhat irregular, many of the results confirm the findings in the first phase, *e.g.*

(i) Cattle manure in the quantity applied is less effective than artificial fertilizers.

Table XVIII.

Variations in Calcium Content of Guinea Grass with Different Manurial Treatments.

(Results calculated as calcium oxide (CaO) on a moisture-free basis)

Serial No.	Details of Manurial Treatment.	Four-Weekly Cutting.		Five-Weekly Cutting.		Three-Weekly Cutting.	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1	Basic slag ...	0.69	0.83	0.63	0.91	0.94	0.90
2	Superphosphate of lime ...	0.37	0.72	0.41	0.70	0.55	0.79
3	Calcium cyanamide ... Basic slag ...	0.91	0.92	0.89	0.75	0.84	0.92
4	Sulphate of ammonia ... Superphosphate of lime ..	0.46	0.78	0.69	0.70	0.76	0.71
5	Calcium cyanamide .. Basic slag ... Sulphate of potash ..	0.76	0.74	0.76	0.86	0.82	1.02
6	Sulphate of ammonia .. Superphosphate of lime .. Sulphate of potash ..	0.57	0.47	0.57	0.55	0.71	0.59
7	Cattle manure ...	0.48	0.59	0.43	0.46	0.45	0.55
8	Control ...	0.48	0.44	0.38	0.45	0.49	0.52

(ii) Apart from cattle manure on both types of soil and superphosphate of lime on 'heavy' soil, the effect of any particular manurial treatment appears to be more marked with the 'light' than with the 'heavy' soil.

(iii) The depressing effect of superphosphate of lime on the 'heavy' soil is again noticeable. The effect becomes less marked apparently with an increase in the interval of cutting.

(e) *Phosphorus.*—Table XIX gives the figures for the first three-monthly cutting period for the phosphorus content of the grass in relation to the different manurial treatments, the three intervals of cutting and the two types of soil.

The results differ considerably from those obtained in the first experiment.

Apart from cattle manure, which in the quantity applied is less effective than artificial fertilizers, all manurial treatments, 'basic' and 'acidic,' yield grass having on the average a remarkably high phosphorus content.

Unlike the results in the first phase, there is no definite indication of a decrease in phosphorus content with an increase in interval of cutting.

Apart therefore from phosphorus, the results may be said to confirm those obtained in the first phase.

Summary of Experiments on Quality of Grass.

Comparing the results obtained in the two phases the combined figures for moisture, crude protein and crude fibre indicate a four-weekly interval of cutting as the limit of the interval to ensure a grass that will be both palatable and not unduly deficient in crude protein. A crude protein content of 11.5 per cent., calculated on a moisture-free basis, corresponds to approximately 2.6 per cent. on the fresh basis (77 per cent. moisture). This figure is only slightly less than that of 3 per cent. published in literature for average meadow grass in Europe.

As regards the mineral content of the grass the figures show that with certain manurial dressings, particularly 'basic' manures, both the calcium and the phosphorus contents of the grass can be more than doubled.

Table XIX.

Variation in Phosphorus Content of Guinea Grass with Different Manurial Treatments.

(Results calculated as phosphoric acid (P_2O_5) on a moisture-free basis)

Serial No.	Details of Manurial Treatment.	Four-Weekly Cutting.		Five-Weekly Cutting.		Six-Weekly Cutting.	
		"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil	"Heavy" Soil	"Light" Soil
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1	Basic slag ...	0.88	0.98	0.92	0.97	0.77	1.03
2	Superphosphate of lime ...	0.89	0.92	0.68	1.00	0.65	0.98
3	Calcium cyanamide ... Basic slag ...	0.81	1.09	0.93	0.87	0.90	0.86
4	Sulphate of ammonia ... Superphosphate of lime ...	0.93	0.83	0.81	1.01	0.79	1.14
5	Calcium cyanamide ... Basic slag ... Sulphate of potash ...	0.67	0.88	0.81	0.90	0.86	0.88
6	Sulphate of ammonia ... Superphosphate of lime ... Sulphate of potash ...	0.98	1.04	0.82	0.77	0.84	0.90
7	Cattle manure ...	0.60	0.74	0.62	0.54	0.50	0.48
8	Control ...	0.57	0.77	0.41	0.92	0.46	0.75

Second Experiment.

Towards the end of 1934 a second experiment was laid down primarily to test different planting distances, but also to ascertain whether better yields than those recorded in the first experiment could be obtained from low-lying land and whether the comparative ineffectiveness of cattle manure would be maintained on such land.

A flat well-drained area on a loam soil at the foot of a slope was chosen (see soil analysis in Table I). The area had previously been a swamp which, after drainage, was planted with carpet grass as a grazing paddock. In 1932, it was ploughed and limed at the rate of 1 ton per acre and kept under *Crotalaria usaramoensis* until October, 1934, when it was dug over and cleaned.

The lay-out was in the form of a four-way Latin Square with plots of 1/10th acre planted "A" 4ft. x 2ft., "B" 3ft. x 2ft., "C" 2ft. x 2ft., "D" 3ft. x 3ft., giving 5,445, 7,250, 10,890 and 4,840 plants per acre. Columns were split into alternate strips receiving cattle manure at the rate of 10 tons per acre per annum and basic slag at the rate of 750 lbs. per acre per annum. Grass was planted in November, 1934; cutting at a uniform monthly rate commenced January, 1935.

Yields, expressed in lbs. of grass per acre per day, are given in Table XX for the period January, 1935 to June, 1936. It will be observed that there were no differences in yield between grass at different planting distances.

Table XX.

Yield of Guinea Grass in lbs. per Acre per Day.

Block 41. First Phase.

	January-December, 1935.					January-July, 1936.				
	A	B	C	D	Mean	A	B	C	D	Mean
Cattle manure ...	175	177	180	175	177	79	79	81	80	80
Basic slag ...	172	176	179	168	173	65	66	65	65	65
Mean ...	174	177	180	171	*176*	72	73	73	73	*73*

Examination of monthly yields (given in Table XXI) shows that differential response to the two manures was manifested only after the fifteenth month.

Table XXI.

Monthly Yields expressed as lbs. of Grass per Acre per Day.

Date	Cattle Manure	Basic Slag.
1935		
January ...	356	400
February ...	195	218
March ...	342	330
April ...	208	206
May ...	198	220
June ...	130	127
July ...	128	125
August ...	134	135
September ...	134	132
October ...	112	99
November ...	92	89
December ...	82	81
1936		
January ...	84	81
February ...	86	84
March ...	57	55
April ...	87	56
May ...	85	62
June ...	83	56

Second Phase.

It was decided to increase the quantity of cattle manure to 15 tons per acre per annum, and to test the effect of nitrogen and potash. To effect this, all basic slag plots received nitrogenous fertilizers, and half of them potash in addition, while half the cattle manured plots received potash at the rates shown in Table XXII.

Table XXII.

Manurial Applications in Second Phase.

Manure		Rate per acre per annum.	Time of Application.	Equivalent to lbs. per annum of—
F.M.	Cattle manure	15 tons	January, July	lbs. 270 nitrogen (N) 400 phosphoric acid (P_2O_5) 107 potash (K_2O)
F.M.+K.	Cattle manure	15 tons	January, July	270 N
	Sulphate of potash	1 cwt.	" "	400 P_2O_5
				164 K_2O
N.P.	Calcium cyanamide	2 cwts.	January, July	88 N
	Sulphate of ammonia	2 "	April, October	
	Basic slag	4 "	January, July	71 P_2O_5
NP+K.	As N.P. and sulphate of potash	1 cwt.	January, July	88 N 71 P_2O_5 57 K_2O

It will be noted that equivalence between the artificial fertilizer and cattle manure has been abandoned; this is essential if costs of the former are not to become fantastic. Both forms of nitrogenous artificials were employed on the off-chance that if one were not nitrified the other might be.

Sub-plots remained at 1/20th acre and there were accordingly only two replicates of each manurial treatment for each planting distance. It was, however, anticipated that there would be no appreciable interaction between planting distance and manures.

Table XXIII gives the results of these heavier dressings and shows that artificial fertilizers have merely maintained yields at a low level, while enhanced application of cattle manure has raised yields to a figure of approximately 100 lbs. per acre per day (equivalent to 16 tons per acre per annum)—a quantity sufficient to support slightly more than 2 cows per acre. These 2 cows would in turn produce 80 lbs. of manure per day or 18 tons per annum, rather less than the quantity supplied.

Table XXIII.

Yields of Guinea Grass in lbs. per Acre per Day - Block 41 - Second Phase.

	July-December, 1936.					January-June, 1937					July-December, 1937.				
	A	B	C	D	Mean	A	B	C	D	Mean	A	B	C	D	Mean
F.M. ...	91	91	86	87	89	104	114	112	99	107	111	118	113	89	108
F.M.K. ...	85	87	93	89	89	106	102	99	108	103	106	99	112	105	106
N.P. ...	50	46	53	49	50	55	50	53	52	53	63	61	58	60	61
N.P.K. ...	53	51	56	51	53	55	53	55	59	56	61	64	70	62	64
Mean ...	70	69	72	69	70	80	80	80	80	80	85	86	88	79	85

Composition of Grass.

Samples of grass were taken in February and March, 1938, and the results of analyses are given in Table XXIV. It will be noted that grass from the poor "artificial" plots is actually better in composition (as measured by protein and fibre content) than that from plots receiving cattle manure. This result confirms those from the first experiment and is important in proving that poor yields do not connote poor material.

Summary.

Experiments designed to ascertain response of Guinea grass to different manurial treatments, intervals of cutting and planting distances are discussed. It is shown that phosphatic manures might be useful to start a new area, but that cattle manure at the rate of 10 to 15 tons per acre per annum is essential if even moderate yields are to be maintained.

Average yields on plots manured with cattle manure at the rate of 10 tons or more per acre per annum were:—on sloping land of medium texture 70 to 80 lbs. of grass per day; on flat light land of poor fertility 55 lbs. per day, and on flat land of medium texture 100 lbs. per day. Taking a daily ration of 40 lbs. of grass per animal 1 acre of grass in these situations would support approximately 1.8, 1.3 and 2.5 cows respectively. If production of manure (including bedding) is taken as 40 lbs. per day (6.5 tons per annum), the maximum manure available for application is 11.7, 8.5 and 16.3 tons per annum. The ration of 40 lbs. grass per day is for local (Indian) cattle; if pure-bred Friesians were stocked a considerably higher ration would be necessary.

Table XXIV.

Results of Analysis of Samples of Guinea Grass from Second Experiment at Serdang.

Manurial Treatment	Moisture Content per cent.	Crude Protein	Crude Fibre	Calcium as CaO	Phosphorus as P_2O_5	Potassium as K_2O
F. M.	75.8	11.8	30.4	1.15	0.68	1.17
F. M. K.	76.3	10.9	31.2	0.72	0.57	1.94
N. P.	75.8	18.3	26.1	1.68	0.60	0.79
N. P. K.	75.8	14.9	28.4	1.34	0.75	0.95

Intervals of cutting ranged from 1 to 6 weeks; the former was found to be much too drastic and yields from fortnightly cuttings on one soil type were significantly (though not markedly from an economic view point) lower than longer intervals. There were no economic differences in yield from 3, 4, 5 and 6 weekly cuttings. Variation in planting distances ranging from 2ft. x 2ft. to 4ft. x 2ft. gave no great differences in yield but an indication that 4ft. x 2ft. was too wide.

Fodder value of the grass measured by crude protein and fibre content was satisfactory when the cutting intervals did not exceed 4 weeks and there was no serious falling off of value with falling yield. There were rather puzzling variations in mineral content of grass, but these are of minor importance in that minerals can be added far more easily and cheaply to rations than increased in grass by application of artificial fertilizers.

Conclusions.

Yields far below figures commonly suggested for Guinea grass, *viz.* 30 to 40 tons per acre per annum, have been recorded at the Central Experiment Station, Serdang, and it seems unsafe on soils of the type normally encountered in Malaya to estimate for stocking at a rate exceeding 1½ cows per acre on soil of moderate fertility and 2 cows per acre on better soil. All the manure would have to be returned to the land and none would be available for use in market gardening.

Even the lowest rate shows a great advantage for stall feeding over pasturage where at least 3 acres would be required to support a cow.

In Leaflet No. 8 of this Department, "Fodder Grasses," it is stated that replanting should be undertaken "when the stools show signs of deterioration and production diminishes, *i.e.* during the third or fourth year." The experiments described suggest that diminution of yield should be taken to refer to yield after the fourth month. Diminution from high values in the first few months may be expected as a normal occurrence. In the first experiment, with inadequate quantities of manure, replanting was necessary after two years; in the second with heavier manuring the stools on cattle manured plots are still healthy three years from planting. It is fair to assume therefore that on soil of reasonable fertility and with adequate manuring the period indicated in the leaflet should be attained without difficulty.

Future Work.

Heavier dressings of cattle manure, and the effect of inter-row cultivation, which was absent from both experiments, will be tried on all three soil types and a comparison of yields of elephant grass with Guinea grass will be made on the soils of the first experiment.

APPENDIX 'A.'

Sampling and Analysis of Guinea Grass at Serdang.

The following is a short description of the sampling and analytical methods adopted in the investigation.

Sampling Procedure.

Commencing from one of the four corners of the sub-plot and looking lengthwise along the sub-plot, any stool of grass in the first six of the outside row is selected, the grass being cut and set aside.

The next stool for cutting is found by moving along to the next row and taking the sixth stool farther along the row, counting from the stool adjacent to that which has already been cut.

A similar procedure is followed until eventually the last stool is taken from the corner diagonally opposite to that in which cutting was commenced.

An example will make the method clear. Assuming that stool No. 3 in the outside row has been selected as the starting point of the cutting, the succeeding stools will be No. 9 in the second row, No. 15 in the third row and so forth.

A similar procedure is followed with the other three sub-plots, the whole of the grass from the four replicates being mixed and constituting a sample from one manurial treatment for a definite interval of cutting.

Since there were eight manurial treatments on two different types of soil the number of samples on each occasion of cutting amounted to sixteen.

The samples were despatched without delay to the laboratory for analysis.

Analytical Procedure.

The analysis of the grass comprised determinations of (a) moisture, (b) crude protein, (c) crude fibre, (d) calcium and (e) phosphorus.

In view of the low crude fat content (ether extract) of the fresh grass, 0.2 per cent. or less, and its relative unimportance as regards composition, it was considered unnecessary to carry out routine analyses in respect of this constituent.

Owing to the large number of samples during the first phase of the first experiment and the impossibility of carrying out individual analyses, analytical work, apart from moisture determinations, was restricted to the estimation of the particular constituents in average samples of grass for the same manurial treatment and interval of cutting collected during a definite period.

The following procedure was therefore adopted. Each sample of grass on arrival was quartered until approximately 200 grammes remained. This quantity was finely chopped, after which two samples for analysis were drawn. Moisture was determined in one sample, crude protein in the other. The sample in which moisture was determined was used subsequently for the determination of the other constituents.

(a) *Moisture.*—Fifty grammes were dried for 24 hours in an electric oven heated to a temperature of 65° to 70°C. The material was allowed to cool and the loss in weight recorded.

A relatively low temperature for desiccation was chosen to reduce to a minimum the possibility of decomposition; the period of drying was maintained at 24 hours to ensure the moisture content of the grass being reduced sufficiently to enable the dried material to be stored without becoming mouldy.

Experiments showed that when dried under these conditions the grass still retained between 5 and 6 per cent. of moisture. A figure of 6 per cent. was accordingly allowed when calculating the absolute moisture content of the fresh grass from the loss in weight recorded by drying for 24 hours at 70°C.

As explained previously, the oven-dried samples were retained until the expiration of the cutting period for the other constituents, being mixed with corresponding samples covering the same manurial treatment and interval of cutting.

It was found that during storage the moisture content of the oven-dried grass increased gradually to about 13 per cent., after which it remained approximately constant. When weighing samples for analysis, therefore, an allowance was made on the above basis; for example, in those cases in which 5 grammes of the moisture-free grass were required 5.75 grammes of the air-dry grass were weighed.

(b) *Crude Protein.*—Five grammes of the fresh grass are digested with 25 cc. of concentrated sulphuric acid, also small amounts of potassium sulphate and copper sulphate, until a clear liquid remains. The latter is diluted with water and the solution adjusted to 250 cc. An aliquot portion, 50 cc., is withdrawn and placed in a bottle, to which are added similar aliquot portions from the corresponding samples of grass for the same manurial treatment and interval of cutting for the remainder of the cutting period.

When the cutting period has been determined, an aliquot portion of the bulked acid solution, corresponding to 2 grammes of the fresh grass, is made alkaline with caustic soda and the ammonia distilled into standard acid, the excess of which is determined by titration with standard alkali. The percentage of crude protein is obtained by multiplying the percentage of nitrogen by the factor 6.25.

(c) *Crude Fibre.*—A quantity of 1.15 grammes of the air-dry grass (1 gramme of moisture-free grass) is boiled for half-an-hour with 75 cc. of 70 per cent. acetic acid, 5 cc. of concentrated nitric acid and 2 grammes of trichloracetic acid under a reflux condenser. The liquid is diluted with water and the contents of the flask filtered through muslin. The residue on the muslin is washed with hot water until free from acid, then with small amounts of alcohol and ether, and dried to constant weight in the steam-oven. The residue is ignited and weighed, the loss in weight being calculated as crude fibre.

(d) *Calcium.*—A quantity of 5.75 grammes of the air-dry grass (5 grammes of the moisture-free grass) is ignited in an electric muffle furnace at a temperature not exceeding 500°C. until a slightly pale grey ash is left. The ash is treated with hydrochloric acid and, after removal of traces of carbon and silica, the solution is made up to 100 cc., aliquot portions being taken for the determination of calcium and of phosphorus.

Calcium is precipitated as calcium oxalate from the acid solution by the appropriate method. Care must be taken to add sufficient ferric chloride to the solution to prevent any of the calcium being precipitated as phosphate when the acid solution is neutralized with ammonia.

The calcium oxalate is filtered off, treated with dilute sulphuric acid and the oxalic acid titrated with standard potassium permanganate. The appropriate factor for converting oxalic acid to calcium oxide is used, in which form the calcium is calculated.

(e) *Phosphorus.*—Phosphorus is precipitated as ammonium phospho-molybdate from the acid solution by the appropriate method. The yellow ammonium phospho-molybdate precipitate is filtered off, treated with an excess of standard potassium hydroxide in which it dissolves, and the excess of standard alkali titrated with standard acid. An appropriate factor for converting standard alkali to phosphoric acid is used, in which form the phosphorus is calculated.

During the second phase of the first experiment, that is longer intervals of cutting, it was possible to dispense with bulking of oven-dried grass and acid solutions owing to the smaller number of samples, the individual samples as received from Serdang being analysed direct.

A change was also made in the catalyst used when digesting fresh grass with concentrated sulphuric acid in the determination of crude protein. Selenium was substituted for copper sulphate.

APPENDIX 'B.'

Statistical Analysis of the Experiments.

First Experiment.

Strictly speaking, statistical analysis can be applied only to the results of the first experiment on the means of manurial treatments, since randomization was limited to plots. sub-plots with different intervals of cutting being arranged in regular sequence. This was recognized at the outset, but the difficulty of supervision of a completely randomized experiment could not have been effectively overcome in the early stages of the experiment.

An attempt has been made to overcome this statistical disadvantage by subtracting two degrees of freedom from the available total of 95, representing the imposed position (horizontal and vertical) of sub-plots in blocks.

Actual analysis was confined to the periods (a) December, 1932 to March, 1933 (part of first phase) and (b) November, 1935 to July, 1936 (second phase). The coefficients of variability found agree remarkably well as follows:—

	"Heavy" Soil		"Light" Soil	
	(a)	(b)	(a)	(b)
Cuttings	14.2	14.1	14.2	12.6
Manures	14.8	12.2	11.9	10.3
Individual treatment				
i.e. Manure x Cultivation.	16.4	16.2	15.7	14.4

Since there has been so little change of variance between the start and finish of the experiment, it is reasonably safe to assume that similar figures will apply to intermediate stages and the following assumed round figures have been used in calculating "significant differences" in Table III.

	"Heavy" Soil.	"Light" Soil.
Cuttings	14	18
Manures	13	10
Individual treatment	16	15

Second Experiment.

Yields from the second experiment have not been statistically analysed. Inspection of the records shows that variation is of the same order as that of the first experiment and that the only difference which could attack significance is that between cattle manure and artificial fertilizers.

Reference.

1. Greenstreet V. R. and Greig J. L. Manurial Experiments with Guinea Grass at Serdang. *Malayan Agricultural Journal*, Vol. XXI, No. 11, November 1933, p. 543.

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CAROTENE IN PALM OIL

BY

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The special dietetic value of palm oil, arising from its pigment carotene, which is a precursor of Vitamin A, is becoming increasingly recognized. There are local publications on the subject ([1], [2] & [3]) and in one of them ([2]) an account is given of the isolation of carotene from palm oil. Several methods of isolating carotene were tried and the most successful was tedious and prohibitive in cost.

The pigment of palm oil, however, is a nuisance in many fields of industry, and is either destroyed or removed from the oil. It is commercially removed by adsorption on activated fullers' earth when the product is required for making high grade toilet soap or even for white edible fats. Experiments have been made in this Department from time to time on adsorptive bleaching of palm oil, but without satisfactory results until recently. Earths activated for use and also proprietary products vary widely in activity, and now two samples of activated earth obtained from the Fullers' Earth Union Ltd., Redhill, Surrey, have given favourable results.

It has also been found that the earth filtered off from the bleached oil can be washed almost free from adhering oil by means of petroleum ether, without any of the adsorbed carotene being extracted. Afterwards, when the washed earth is suspended in acetone the carotene instantly passes into solution, and after evaporation of the filtered solution under reduced pressure, a small bulk of oleaginous residue contains the carotene. If ether is used, after washing the earth, the carotene appears to pass into solution, but after the earth has been exhausted by ether, acetone removes a further amount. Ethyl acetate behaves similarly to ether. The differentiation observed may be due to the different forms of carotene occurring in palm oil.

No attempt has been made to purify the crude acetone extract, but it appears that the above procedure offers a very convenient way of obtaining carotene. Even with incomplete washing of adhering oil from the used earth, the product would be a "concentrate" very rich in carotene.

It may be added that as the bleaching may be carried out in a vacuum and at a temperature below 100°C., it should be easy to avoid the possibility of oxidation.

1. Rosedale, *Malayan Medical Journal,* Vol. IX p. 140, 1934.
2. Simpson. Bulletin of the Institute for Medical Research, No. 1 of 1936.
3. Buckley, *Malayan Agricultural Journal,* Vol. XXIV p. 485, 1936.

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Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

May, 1938.

The Weather.

In Kedah the rainfall, though less than in April, was abundant and in excess of the normal precipitation for this month. The second half of the month was also very wet in Penang.

In Kelantan the dry weather experienced during the previous month came to an end and the rainfall was regular and a little above average. The East Coast of Pahang, was, however, abnormally dry.

Throughout the west coastal areas the precipitation was very much lower than during April. The dry weather period has now set in. In Perak and Selangor the weather was hot with some showers. In the inland districts of Pahang and Negri Sembilan light and regular rain was experienced and the total precipitation was about average. In Malacca the latter half of the month was rather dry.

Rainfall in Johore was on the whole normal for this time of the year, but the distribution was very uneven and at Segamat and Batu Pahat conditions of drought prevailed. In the South East and at Singapore there was rather more rain and the total precipitation was above average.

Remarks on Crops.

Rubber.—The market price of rubber was, if anything, slightly lower than during the previous month; $22 to $23 were the highest prices paid by dealers for smoked sheet.

In a great many parts there has been a definite decline in the value of export rights, a common quotation being $13 per picul equivalent. On the other hand, the price of coupons in Malacca rose to $18 per picul equivalent, whereas the price of uncouponed rubber fell to as low as $4 per picul.

Although the difference in the price between smoked and unsmoked sheet is, in many instances, very small, the erection of many additional smoke cabinets is recorded in reports, notably in Perak where the number was increased by 8 and in Pahang where 9 were erected.

The scheme whereby rubber dealers display samples of grades and a list of prices outside their shops, which was inaugurated in Pahang, is being brought into force in Perak and Selangor.

Padi.—The price of padi in Penang has increased to $2.20 per picul. At the Government Rice Mill in Krian $2.10 per picul is still being paid. In Krian approximately 92,000 bags of the strain "S.48" have been inspected and sealed as a guarantee of qualification for the premium of 10 cents a picul paid at the Government Mills for this strain.

The harvest in Krian and the north of Perak has now been completed and the land is lying fallow. In the south, in the Dindings and at Panchang Bedina and Tanjong Karang some of the crop still remains to be harvested.

In central Johore it is reported that economic stress has resulted in greater interest in padi planting and areas which have long been out of cultivation are being reopened. As irrigation facilities are not available on the lands concerned, the prospect of cultivators obtaining any great quantity of padi as a result of their efforts is small.

Pineapples.—The price of canned pineapples still remains very low. Most of the fruit at present being canned is grown in large plantations. The price paid for fresh fruit (at present 40 to 60 cents per hundred in Selangor, 80 cents to $1.80 in Singapore) does not make it worth while for the small-holder to sell his small quantities of fruit to the factories.

FERTILIZER PRICES, MAY, 1938.

The following are the prices at the end of May, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are ex Warhouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $81.50 per ton respectively.

Statistical.

MARKET PRICES.

May 1938.

Major Crops.

Rubber.—Prices were on a low level throughout the month with only minor fluctuations. Spot loose opened in Singapore at 18¼ cents per lb. and rose to 20⅛ cents on the 12th May; it subsequently weakened again, falling to 17¾ cents on the 27th, but recovered to close at 18⅞ cents.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 18.96 cents per lb., as compared with 19.26 cents in April. The London average price was 5.68 pence per lb., and the New York price 11.49 cents gold, as compared with 5.77 pence and 11.69 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, May, 1938.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.			Kuala Kangsar, Perak.		Batu Pahat, Johore.			
	5	12	26	11	18	4	11	18	25
Smoked sheet		24.00	22.20	23.00	22.50				20.00
Unsmoked sheet	21.00	21.50	20.50		20.00	20.00	20.90	19.80	18.50
Scrap									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 4th and 25th May, and at Kuala Pilah on the 19th May.

Palm Oil.—The Market for palm oil maintained its position, but lower prices were recorded for palm kernels. Quotations during May are given in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
May	6	£ 14. 0. 0	£ 9. 10. 0
„	13	14. 0. 0	9. 7. 6
„	20	14. 10. 0	9. 7. 6
„	27	14. 0. 0	8. 17. 6

Copra.—For the first half of May the market remained steady, but weakened considerably towards the end of the month. The sun-dried grade opened at $3.80 per picul and maintained this level until the 19th May, after which date it fell steadily to close at $3.25, with an average for the month of $3.71 per picul, the mixed grade continuing 40 cents lower. The April average price was $3.62 per picul.

Copra cake rose to $2.10 per picul at the end of the month. The average price was $1.88 per picul.

Rice.—The average wholesale Singapore prices of rice per picul in April were as follows:—Siam No. 2 (ordinary) $3.98; Rangoon No. 1 $3.62; Saigon No. 1 $3.85; as compared with $4.09, $3.62 and $3.92 in March, and with $4.40, $3.57 and $3.70 in April 1937.

The average retail prices in cents per gantang of No. 2 Siam rice were again unchanged: Singapore 28, Penang 32, Malacca 28.

The average declared trade value of imports during April was $3.91 per picul as compared with $3.89 in March and $3.85 in February.

Padi.—The Government Rice Mills, Perak, continued to pay $2.10 per picul for padi. The price in the field tended to rise, the usual price in padi-growing districts being from $8 to $9 per 100 gantangs, while in towns and non-padi growing districts the price was between $10 and $15 per 100 gantangs.

Pineapples.—Prices per case of canned pineapples remained unchanged over those of last month, and were as follows:—G.A.Q.: Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality: $2.85, $2.80 and $2.95 respectively.

Beverages.

Tea.—Six consignments of Malayan tea were sold on the London Market during May, one upland and five of lowland tea. The upland tea sold at 1s. 3d. per lb., while the prices of the lowland tea ranged from 1s. 0d. to 1s. 1¼d. per lb.

Average London price per lb. during May for consignments of tea from other countries were as follows:—Ceylon 1s. 3. 22d., Java 1s. 1. 82d., Indian Northern 1s. 2. 22d., Indian Southern 1s. 2. 81d., Sumatra 1s. 09d.

The latest Colombo average prices available, quoted from *The Weekly Tea Market Report,* 24th May, 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 75 cents, Medium Grown Teas 67 cents, Low Grown Teas 63 cents.

Coffee.—Palembang coffee improved slightly to average $11.12 to $13.12 per picul, while Sourbaya weakened to $9.19 to $10.19. The April averages were $8.44 to $9.44 and $11.88 to $12.94.

Prices in Singapore of other varieties of coffee were as follows (per picul):—Liberian $14, Excelsa $10, falling to $9; Robusta $7, falling to $6.50.

Spices.

Arecanuts:—The range of Singapore prices per picul during the month was as follows:—Splits $4.06 to $5.94; Red Whole $4.19 to $6.25; Sliced $6.31 to $8.50.

The averages of the Singapore Chamber of Commerce quotations per picul were:—Best $7.17, Medium $6.62, Mixed $6.19.

Pepper.—The price of black pepper was quoted throughout the month at last month's figure, viz. $8.25 per picul. White and Muntok declined 25 cents at the end of the month to $13.50 and $13.75, the average prices during May being White $13.69, Muntok $13.94, as compared with $13.75 and $14 in April.

Nutmegs.—The price of both 110's and 80's dropped $1 per picul to $30 during the second half-month, the average price of both grades being $30.50 per picul as compared with $32 in April.

Mace.—The price of Siouw continued unchanged throughout the month at $90, while Amboina was marked down $1 at $74 per picul.

Cloves.—Zanzibar and Amboina cloves were quoted unchanged at $40 per picul (nominal).

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports for May from Rs. 1.30 to Rs. 1.60 per lb.

Miscellaneous.

Derris.—Values of average qualities have a downward tendency owing to fair supplies being available and to lack of orders from abroad. Prices for the better rotenone varieties, however, have been well maintained, as supplies, which are rather small, are promptly taken up by the trade. Average prices in May were, for roots sold on a basis of ether extract $15 to $16 per picul; root sold on rotenone content $24 per picul.

Gambier.—Block gambier improved 50 cents per picul over April quotations at $7.50 per picul; No. 1 Cube remained at $15.50 per picul.

Tapioca.—The price of Flake Fair dropped 15 cents per picul during the second half of the month, while Seed Pearl and Medium Pearl declined 25 cents. Average prices per picul in May were:—Flake Fair $4.17, Seed Pearl $4.12, Medium Pearl $4.87 as compared with $4.25, $4.37, $5.

Sago.—Prices shewed some decline over those ruling in April. Pearl, Small, Fair averaged $3.61; Flour, Sarawak Fair, $1.95, as compared with $3.87 and $2.19 respectively in April.

Tobacco.—The price of tobacco varies considerably from district to district. The general range of prices per picul for dried leaf was as follows:—1st quality $30 to $45; 2nd quality $20 to $35; 3rd quality $10 to $25. Prepared tobacco prices per picul were:—Lower Perak $64 to $100; Kelantan 1st quality $105, 2nd quality $87.50; 3rd quality $62.50; Negri Sembilan $58, $48, $38. Java tobacco in Johore was sold at $40 to $80 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., and Messrs. Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The Dollar is fixed at two shillings and fourpence.

Note.— The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

April, 1938.

Malaya.—Imports of foreign rice during April were 67,137 tons,† and exports 15,390 tons, net imports being 51,747 tons as compared with 47,364 tons in 1937.¶

Of the imports during April, 49 per cent. were consigned to Singapore, 16 per cent. to Penang, 6 per cent. to Malacca, 22 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 43,061 (64.1), Burma 22,073 (32.9), French Indo-China 853 (1.3), other countries 1,150 (1.7).

Of the exports during April, 79 per cent. were consigned to the Netherlands Indies and 21 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 10,310 (67.0), Burma 4,519 (29.4), French Indo-China 439 (2.8), parboiled 39 (0.3), local production 83 (0.5).

India and Burma.—Exports from India during the first quarter of the year totalled 61,000 tons as compared with 525,000 tons in 1937, a decrease of 88.4 per cent. Of these exports 4.9 (4.6) per cent. were to the United Kingdom, 8.2 (7.0) per cent. to the Continent of Europe, 44.3 (26.1) per cent. to Ceylon, 4.9 (26.1) per cent. to the Straits Settlements and the Far East, and 37.7 (36.2) per cent, to other countries. The percentages in brackets are for the corresponding period of 1937.

Burma's exports from the 1st January to 20th April totalled 1,210,474 tons, an increase of 0.6 per cent. when compared with the previous year's figures of 1,202,836 tons, Of these exports 43.4 (47.1 per cent. were to India, 9.1 (8.8) per cent. to the United Kingdom, 7.2 (4.6) per cent. to the Continent of Europe, 11.4 (11.2) per cent. to Ceylon, 14.0 (13.1) per cent. to the Straits Settlements and the Far East, and 14.9 (15.2) per cent to other countries. The percentages in brackets are for 1937.

Siam.—Exports of rice and rice products from Bangkok during February were 153,451 tons, as compared with 119,456 tons in 1937.

Japan.—The latest information available was published in the February Summary.

French Indo-China.—Entries of padi into Cholon during the first four months of the year totalled 518,565 tons as compared with 608,303 tons, a decrease of 14.8 per cent. Exports of rice during the same period were 494,319 tons as compared with 526,499 tons in 1937, a decrease of 6.1 per cent.

The Netherlands Indies.—The latest information available was published in the March Summary.

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* Abridged from the Rice Summary for April 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Ceylon.—Imports during the first four months of the year totalled 183,572 tons as compared with 182,567 tons in 1937, an increase of 0.6 per cent. Of these imports 15.6 (16.1) per cent. were from British India, 73.6 (71.6) per cent. from Burma, 0.5 (0.2) per cent. from the Straits Settlements, and 10.3 (12.1) per cent. from other countries. The percentages in brackets are for 1937.

Europe and America.—Shipments from the East to Europe from the 1st January to 8th April totalled 307,713 tons as compared with 334,733 tons in 1937, a decrease of 8.1 per cent. Of these shipments 56.9 (48.8) per cent. were from Burma, 33.2 (38.4) per cent. from Saigon, 7.2 (8.8) per cent. from Siam and 2.7 (4.0) per cent. from Bengal. The 1937 percentages are in brackets.

Shipments for the Levant from the 1st January to 7th April were 6,610 tons as compared with 4,587 tons in 1937, an increase of 44.1 per cent. Shipments for Cuba, West Indies and America from 1st January to 28th March totalled 60,628 tons, a decrease of 15.3 per cent. when compared with the 1937 shipments of 71,607 tons.

MALAYAN AGRICULTURAL EXPORTS, APRIL, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./April 1937	Jan./April 1938	April 1937	April 1938
Arecanuts ...	30,084	11,767	13,977	3,251	2,646
Coconuts fresh † ...	95,223†	26,830†	30,183†	9,098†	7,438†
Coconut oil ...	39,762	11,671	14,515	3,217	3,010
Copra ...	75,592	17,519	12,442	1,395	2,302
Gambier, all kinds ...	1,955	677	509	153	84
Copra cake ...	15,026§	4,391§	2,088	774	485
Palm kernels ...	7,312	2,015	2,785	445	609
Palm oil ...	42,787	13,155	16,515	4,020	3,565
Pineapples canned ...	80,502	27,652	26,908	8,581	6,697
Rubber ¶ ...	503,127¶	146,196¶	135,968¶	33,085¶	27,603¶
Sago,—flour ...	15,478	8,264	2,132	1,473	388*
,, —pearl ...	3,759	1,118	1,375	237	413
,, —raw ...	8,256*	2,560	2,332*	625*	622*
Tapioca,—flake ...	1,058	411	320	88	74
,, —flour ...	2,393*	953*	1,262*	452*	404*
,, —pearl ...	18,786	5,382	5,232	1,679	1,162
Tuba root ...	573	214	181	38	51

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March ...	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
Total ...	8,605.4	5,732.0	1,554.5	1,055.0
Total January to April, 1937	7,115.9	5,427.4	1,350.7	946.8
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 30th April, 1938 were: palm oil 1,985 tons, palm kernels 536 tons.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 30th April, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of tappable rubber not tapped: Estates which have entirely ceased tapping: Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Percentage of (7) to (2)	Under rotational systems: Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,386	22,569	52.0	2,380	5.5	9,800	22.6	8,637	19.9	403	0.9	20,817	48.0
Malacca ...	122,504	69,840	57.0	2,319	1.9	20,558	16.8	29,787	24.3	2,066	1.7	52,664	43.0
Penang ...	2,488	1,311	52.7	258	10.4	859	34.5	60	2.4	36	1.4	1,177	47.3
Singapore ...	32,381	18,299	56.5	2,921	9.0	6,471	20.0	4,090	14.5	103	0.3	14,082	43.5
Total S.S. ...	200,759	112,019	55.8	7,878	3.9	37,688	18.8	43,174	21.5	2,608	1.3	88,740	44.2
F. M. S.—													
Perak ...	288,356	178,723	62.0	3,276	1.1	51,590	17.9	54,767	19.0	7,384	2.6	109,633	38.0
Selangor ...	327,521	219,883	67.1	7,161	2.2	38,532	11.8	61,945	18.9	6,377	1.9	107,638	32.9
Negri Sembilan ...	254,238	161,060	63.4	6,768	2.7	35,709	14.0	50,701	19.9	7,582	3.0	93,178	36.6
Pahang ...	86,199	55,432	64.3	2,814	3.3	18,376	21.3	9,577	11.1	6,982	8.1	30,767	35.7
Total F.M.S. ...	956,314	615,093	64.3	20,019	2.1	144,207	15.1	176,990	18.5	28,325	3.0	341,216	35.7
U. M. S.—													
Johore ...	475,550	319,124	67.1	5,493	1.2	79,830	16.8	71,103	14.9	34,861	7.3	156,426	32.9
Kedah ...	197,805	130,656	66.1	5,722	2.9	22,369	11.3	39,058	19.7	6,901	3.5	67,149	33.9
Kelantan ...	31,230	21,689	69.4	243	0.8	5,317	17.0	3,981	12.8	2,182	7.0	9,541	30.6
Trengganu (b) ...	4,817	3,143	65.3	nil	nil	74	1.5	1,600	33.2	74	1.5	1,674	34.7
Perlis (c) ...	1,371	858	62.6	216	15.8	257	18.7	40	2.9	84	6.1	513	37.4
Brunei ...	5,417	1,809	33.4	nil	nil	2,730	50.4	878	16.2	556	10.3	3,608	66.6
Total U.M.S. ...	716,190	477,279	66.6	11,674	1.6	110,577	15.5	116,660	16.3	44,658	6.2	238,911	33.4
Total Malaya ...	1,873,263	1,204,396	64.3	39,571	2.1	292,472	15.6	336,824	18.0	75,591	4.0	668,867	35.7

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX FOR THE MONTH OF APRIL, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to April 1938		during the month		January to April 1938						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to April 1938	during the month	Jan. to April 1938	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to April 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	10,528	14,310	10,428	47,008	4,738	22,705	Nil	Nil	Nil	Nil	14,953	1,911	54,765	14,911	...	9,034	14,092	14	58
Johore ...	...	4,703	5,389	4,798	21,622	1,438	12,402	Nil	10	Nil	95	3,436	3,429	13,425	20,855	...	3,615	5,858	...	...
Kedah ...	...	298	3,645	2,579	11,808	709	3,636	Nil	Nil	Nil	Nil	1,840	1,414	8,043	7,552	...	345	3,632	...	...
Perlis ...	...	12	23	13	57	20	88	Nil	Nil	Nil	Nil	Nil	22	Nil	124	...	23	23	...	...
Kelantan ...	...	1,035	228	341	1,415	197	2,299	Nil	Nil	Nil	Nil	313	481	1,034	2,759	...	672	335	...	...
Trengganu ...	...	55	50	193	1,114	96	557	Nil	Nil	Nil	Nil	Nil	289	Nil	1,671	...	55	50	...	...
Brunei ...	...	Nil	69	19	181	31	259	...	...	...	...	...	58	...	454	...	6	55	...	...
Total Malay States	...	16,631	23,714	18,371	83,205	7,229	41,945	Nil	10	Nil	95	20,542	7,604	77,267	48,326	...	13,750	24,045	14	58
S. SETTLEMENTS :—																				
Malacca ...	...	2,444	1,433	1,069	4,780	157	2,093	Nil		Nil		2,650		10,380		...	2,498	1,434	...	...
Province Wellesley	...	3,244	727	404	1,727	89	832	Nil		Nil		8,312		33,230		...	2,287	657	...	...
Penang ...	2,817	6,212	10	15	79	16	350	1,566	10,618	8,798	52,831		Nil		Nil	2,405	4,953	12	...	...
Singapore ...	9,058	32,727	226	145	654	18	253	7,543		44,926		22,360		79,069		4,798	28,472	282	27	100
Labuan ...	...	44	Nil	Nil	Nil	Nil	50	49		199		Nil		Nil		...	43	Nil	...	...
Total Straits Settlements ...	11,875	44,671	2,396	1,633	7,240	280	3,578	9,158	10,618	53,923	52,831	33,322	Nil	122,079	Nil	7,203	38,253	2,885	27	100
Total Malaya ...	11,875	61,302	25,110	20,004	90,445	7,509	45,523	9,158	10,628	53,923	52,926	53,864	7,604	199,946	48,326	7,203	52,003	26,430	41	158

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Prov-ince We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	8.015	27.491	4.845	4.494	2.951	140
WET RUBBER	1.019	981	108	340	664	215
TOTAL ...	9.034	28.472	4.953	4.834	3.615	345

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. to Apr 1938. 31
Singapore ...	36.586	132.738
Penang ...	11.824	48.072
Port Swettenham	5.162	18.352
Malacca ...	292	784
MALAYA ...	53.864	199.946

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. to Apr 1938 34
Malay States ...	28,080	125,265
Straits Settlements	2,139	10,499
MALAYA ...	30,219	135,764

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.* Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th May, 1938

METEOROLOGICAL SUMMARY, MALAYA, APRIL, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	91.2	73.4	82.3	93	71	87	76	85.3	85.6	6.20	157.5	0.97	20	19	5	14	2	182.55	6.09	50
Bukit Jeram, Selangor ...	89.5	73.3	81.4	93	71	85	75	85.6	87.3	11.33	287.8	2.87	19	18	6		1	234.40	7.81	64
Sitiawan, Perak ...	89.6	74.4	82.0	92	72	87	77	85.2	85.3	4.76	120.9	1.15	20	15	1	1		226.85	7.56	62
Ipoh Aerodrome, Perak ...	90.9	73.5	82.2	95	71	85	75	84.4	84.9	12.44	316.0	1.40	24	24	11	1		200.70	6.69	55
Temerloh, Pahang ...	90.6	73.6	82.1	94	71	85	75	87.3	86.9	5.61	142.5	2.18	15	9	2	6		181.55	6.05	49
Kuala Lipis, Pahang ...	91.0	72.7	81.9	94	70	88	75	85.3	85.2	4.94	125.5	2.33	23	16	3	19		191.70	6.39	52
Kuala Pahang, Pahang ...	87.5	75.8	81.7	89	74	85	80	86.3	87.2	12.03	305.6	4.06	19	12	4			241.90	8.06	66
Kallang Aerodrome, S'pore ...	86.7	75.7	81.2	90	73	82	78	82.9	83.5	8.81	223.8	2.07	20	16	8		1	162.25	5.41	44
Bayan Lepas Aerodrome Penang ...	88.0	74.9	81.5	91	72	84	78	85.0	85.1	12.10	307.3	1.62	26	22	15			220.25	7.34	60
Bukit China, Malacca ...	86.6	74.4	80.5	91	72	81	77	83.8	84.8	7.44	189.0	1.69	21	19	10	1	1	200.65	6.69	55
Kluang, Johore ...	89.8	72.3	81.1	93	70	82	74	82.8	82.6	7.66	194.6	1.21	23	19	9	15		181.05	6.03	49
Bukit Lalang, Mersing, Johore	87.8	73.1	80.5	91	71	85	79	83.1	82.2	7.15	181.6	1.68	15	14	4		1	213.00	7.10	59
Alor Star, Kedah ...	89.7	74.6	82.1	93	72	85	77	85.4	86.2	18.36	446.3	4.12	19	17	5		1	228.80	7.63	63
Kota Bahru, Kelantan ...	89.9	74.5	82.2	93	73	84	77	85.4	84.7	1.23	31.2	0.54	8	6				260.05	8.67	71
Kuala Trengganu, Trengganu	88.9	73.9	81.4	92	72	87	79	85.2	85.1	0.62	15.7	0.31	6	3		3		260.40	8.68	71
HILL STATIONS. Fraser's Hill, Pahang 4268 ft.	74.6	63.4	69.0	78	62	71	65	72.9	72.6	11.91	302.5	2.35	27	24	6	15	1	145.75	4.86	40
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.8	58.8	66.3	77	53	70	64	71.3	70.5	11.14	283.0	1.55	26	24	2			148.85	4.96	40
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.4	61.0	67.2	77	59	68	62			11.36	288.5	1.64	25	24				162.40	5.41	44

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

JULY, 1938

EDITORIAL.

Manuring of Oil Palms.

Progress reports of experiments on the manuring of oil palms have been published from time to time in the pages of this journal and have shewn that under the conditions of the particular experiments, the annual manuring of palms from the age of about 7 years with rock phosphate, is an economic proposition. Similar experiments by another authority have confirmed these results and indicated that a response to this system of manuring may be expected over a wide range of Malayan inland soils.

In the present issue we include a report on further observations of these experiments. The figures shew a marked falling off in yields if the land is not manured regularly, and a lack of response—not fully explained—when the palms are again manured after a period of three years without manuring.

While the results to-date conclusively demonstrate the value of manuring with rock phosphate at regular intervals, the value of applying a more complete manure at longer intervals is not yet assessed. Until more conclusive results have accrued on this point, planters are advised, as a measure of insurance, to apply a complete fertilizer every third year from the time the palms are twelve years old.

"Dwarfs v Talls."

A memorandum included in this number places on record the history in Malaya of the cultivation of dwarf coconuts and briefly states the present recommendations of the Department as to the advisability or otherwise of cultivating this type.

In the past, the high yields obtained from "dwarfs" on certain estates appeared to support the contention that the planting of this type would be more remunerative than planting "talls." As a result of more recent investigations, however, it appears that "dwarfs" are more sensitive to unfavourable soil and water conditions than the tall palm. Although very remarkable yields are obtainable if conditions are ideal, in most instances yields are only fair or are poor because the conditions do not fulfil the exacting requirements of the dwarf palm.

Cashew Nuts in Malaya.

To those of our readers who are conversant with the east coast of Malaya—Pahang, Kelantan and Trengganu, the cashew nut tree will require no introduction, it is commonly found in these districts although it is seldom cultivated.

Efforts have been made from time to time to commercialize the industry, but to-date, all such attempts have failed owing to the fact that the trees are generally scattered, there is difficulty in obtaining a good quality raw product and the local inhabitants are unable to prepare the nuts in a form suitable for the market.

There is, however, a market for cashew nuts and the difficulties enumerated above are not insuperable.

Included in this number we publish an abstract of an article on the cashew nut industry in Southern India. The methods used in India may be taken as a model, for it is from India that the bulk of world supplies are obtained.

In another paper* the author points out that the tree flourishes under varying soil and rainfall conditions in Ceylon. It is found on laterite and on white quartz sand under a rainfall of about 80 inches, distributed during two monsoons, while in another area it grows on coastal sand with a north-east monsoon during which most of the rainfall of about 40 inches is received. In Ceylon, therefore, the tree grows on the poorest soil unsuited to most other crops, and withstands drought. It has come to be regarded as a wasteland crop and can well be extended in most parts of the dry zone without irrigation.

We have made enquiry regarding the cashew nut tree in Pahang and Kelantan. In Pahang it is nowhere abundant and is never cultivated; in the two coastal districts of Pekan and Kuantan there are estimated to be about 1,700 trees. In Kelantan the tree is commonly found throughout the coastal plain, where it grows on a wide range of soils. It is noteworthy as one of the few plants of economic value which do well on the infertile sandy soils of the coastal belt. The annual rainfall on the east coast is over 100 inches, nearly half of which is precipitated during the north-east monsoon in the last three months of the year. Normally there is but one crop a year, between April and June. The yield varies between 200 and 1000 fruits per annum according to age and vigour of the tree, but 500 fruits a year can be taken as a fair average figure.

We have occasionally received enquiry from the east coast regarding the preparation and marketing of the nut. Hitherto, we have experienced no difficulty in finding a local market for the product, but the nuts have never been delivered. This has probably been due to the difficulty in organizing collection and lack of knowledge of the preparation of the nut. The statement of the methods used in India may focus attention on the potential value of this crop and serve as a guide to renewed attempts to establish the industry.

* Sessional Paper V—1937. 11.-The Cashew Nut Industry of South India, by W. R. C. Paul. March 1937. To be purchased at the Government Record Office, Colombo, Ceylon, price 10 cents (Ceylon currency).

Original Articles.

MANURIAL EXPERIMENTS ON OIL PALMS

BY

J. H. DENNETT,

Senior Chemist (Soils.)

An account has been published in *The Malayan Agricultural Journal** of the results of experiments on the manuring of oil palms on Block 5D at Serdang and on two estates up to July 1935. The present article brings those records up to date (December 1937).

Estate A.

The article quoted showed that the manures were applied to the experimental plots on this estate at 6-monthly intervals from July, 1930, to 1932, after which no manure was applied until July 1935. Applications were withheld for 3 years in order to find the duration of effect of application. Actual findings will be discussed later. In July, 1935, an attempt was made to ascertain the best method of application of fertilizer by applying rock phosphate to all these palms in three different ways—(a) broadcast, (b) cover (grass and weeds) cleared to just beyond the spread at the time of application, manure turned in to a depth of three or four inches and the aisle kept clear and (c) as in (b) but undergrowth allowed to grow after application of the fertilizers crossing the previous treatments. No differences emerged as a result of these new treatments, but the poor all-round response obtained makes it impossible to draw definite conclusions. Yields are given in Tables I and II.

Table I.

Yield in Pounds of Fruit Bunch per Mature Palm on Quartzite Hill Soil.

Estate A. Palms planted 1922.

Treatment to July 1932.	No. of Mature Palms.	1929	1930	1931	1932	1933	1934	1935	1936	1937
*NPK	36	101	148	234	259	286	198	138	154	130
NPK + Mg	17									
PK	40	71	118	199	240	247	187	129	146	127
PK + Mg	19									
P	37	86	148	240	246	257	209	136	135	143
P + Mg	17									
Control	53	90	177	167	181	185	141	114	145	128
Mean		88.5	147.8	210.0	231.5	242.2	184.0	129.2	145.0	132.0

* Vol. XXV No. 7 July 1937.

* The reasons for averaging these treatments are given in the *Malayan Agricultural Journal* for 1935, page 323.

Table II shews these results calculated as a percentage of the controls.

Table II.

Yields Expressed as Percentage of the Controls.

Estate A.

Treatment to July 1932.	1929	1930	1931	1932	1933	1934	1935	1936	1937
NPK ...	112.2	83.6	140.1	143.1	154.6	140.4	121.1	106.1	101.6
PK ...	85.6	66.7	119.2	132.6	133.5	132.6	113.2	100.6	99.2
P ...	95.6	83.6	143.7	135.9	135.7	148.2	119.5	93.5	111.7
Control ...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

There are three possible explanations of lack of response to the 1935 treatment: (i) that the general health of the palms has deteriorated to such an extent following three years without fertilizer, that a single application of phosphate was insufficient, (ii) that the palms had reached the stage at which phosphate alone was insufficient and a more complex manurial mixture was needed, (iii) that palms on hill quartzite soil deteriorate at about 14 years from planting. Possibly (iii) is rendered improbable by the continued good yield of other palms on the same estate which have received phosphate manures for the past three years; visual examination of the experimental palms gives the impression that although not actually unhealthy they are suffering from some deficiency, but it is impossible to say whether the probability of (i) or (ii) is the greater. It has been decided to abandon for the present the attempt to ascertain the best method of application and to revert to the old layout—applying as treatments NPK, NP, PK and P. This should in the course of two years provide much needed information.

Table III.

Mean Number of Bunches per Palm. Estate A.

Treatment to July 1932.	1929	1930	1931	1932	1933	1934	1935	1936	1937
NPK ...	5.8	6.1	8.9	9.2	8.8	5.9	4.2	4.1	4.6
PK ...	4.6	5.8	8.9	9.1	8.3	6.2	4.8	4.8	4.6
P ...	4.9	7.9	10.6	9.7	8.7	7.2	5.8	5.0	4.7
Control ...	5.6	7.4	7.6	7.9	6.9	5.1	4.3	5.2	5.0

Table IV.

Mean Weights of Unit Bunches. Estate A.

Treatment to July 1932.	1929	1930	1931	1932	1933	1934	1935	1936	1937
NPK ...	17.4	24.3	26.3	28.2	32.6	33.7	32.8	37.5	28.3
PK ...	16.7	20.4	22.3	26.4	29.8	30.1	26.9	30.2	27.6
P ...	17.6	18.7	22.6	25.4	28.9	29.3	23.5	27.0	30.5
Control ...	16.2	23.9	21.9	23.9	27.0	27.6	26.7	27.9	25.6

It will be seen from Tables III and IV that the fall in the yield in the last three years is due to fall in the number of fruit bunches produced and not to decrease in weight of individual bunches.

Serdang (5D).

The manurial layout on the experimental area at the Central Experiment Station at Serdang was altered somewhat in the period under review.

The manures put down in 1932 were per palm

A.	NPK	2 lbs. Calcium Cyanamide
		6 lbs. Rock Phosphate (30 per cent. P_2O_5)
		2 lbs. Kainit
B.	N P	2 lbs. Calcium Cyanamide
		6 lbs. Rock Phosphate
C.	P (Rock)	6 lbs. Rock Phosphate
D.	P (Basic)	6 lbs. Basic Slag
E.	Control	

There was thus a comparison between NPK, NP, P, and also of basic slag against the cheaper rock phosphate.

Results showed that there was little or no difference between the two kinds of phosphate and that phosphate alone was sufficient. For the same reason as on Estate A, i.e. to determine duration of benefit from fertilizer no manure was applied in 1933 and 1934. In 1935 when yields were falling rapidly, the following programme was laid down:—

A. NPK in 1935 with P every year, N every other and K every third year.
B. P (rock phosphate) every other year.
C. P (,, ,,) every year.
D. P (rock phosphate dust) every year.
E. Control.

This programme was based on the finding that P alone had proved necessary and sufficient in 1932, but that as the palms grew older there was the possibility that a complete mixture would be necessary. Results are given in Tables V to VIII and Graph 2 and show as for Estate A a general fall of yield. Unfortunately, deductions other than the necessity for phosphate cannot be made because of the appearance of "bronzing" leading to "wilt" which is distributed throughout all plots and has undoubtedly led to a reduction in yield which may or may not have unequally and partially counterbalanced increases due to manures—as an example the higher yield from the "B" plots (NP) in 1936 and 1937 cannot with any degree of probability be ascribed to a single application of N in 1932.

In an endeavour to counteract the then incipient "bronzing" the manurial programme was modified in 1937 to the following:—

A. NPK in 1937, thereafter P every year and NK in addition every other year.
B. NP in 1937, thereafter P every year and N every other year.
C. Rock phosphate every year.
D. ,, ,, dust every year.
E. Control.

Dressings applied in 1937 could not have affected yields in that year and hence have been omitted from tables.

As a further experiment, the plots have been split and compost applied to 15 of the 30 trees in each plot. It is to be noted that throughout this experiment "NPK" has included magnesium as the potash was applied in the form of kainit.

The same troublesome factor, "bronzing and wilt," has spoilt the value of an interesting series of observations on the effects of artificial pollination combined with manuring. On "pollinated" palms ten bunches per annum were pollinated, on "unpollinated" none. Yields are given in Tables IX and percentages of cleaned fruit from different sources in Table X.

Table V.

Mean Yields in pounds of Fruit Bunches per Palm at the Central Experiment Station, Serdang, Block 5D.

Treatment	No. of Palms	July-Dec. 1932.	Calculated yield 1932	1933	1934	Treatment	1935	1936	1937
NPK A ...	150	95.9	201.2	224.8	201.1	NPK ...	204.6	132.6	177.0
NP B ...	150	64.3	137.8	170.4	182.5	P (alternate)	183.3	142.0	156.1
P (Rock) C ...	150	67.7	155.4	176.4	163.0	P (annual)	162.6	101.3	124.0
P (Basic) D ...	150	67.5	166.0	163.9	155.6	P (dust) ...	155.3	106.0	139.1
Control E ...	150	67.3	162.8	124.1	115.7	Control ...	116.0	86.6	85.8

Table VI.

Yields Expressed as percentage of Controls - Block 5D.

Treatment	July-Dec. 1932	1933	1934	Treatment	1935	1936	1937
N P K ...	142.5	181.0	173.9	N P K ...	177.0	153.1	206.2
N P ...	95.5	137.1	147.8	P (alternate) ...	158.2	163.8	177.8
P (Rock) ...	100.7	142.1	141.0	P (annual) ...	140.1	117.0	144.6
P (Basic) ...	100.4	132.0	134.5	P (dust) ...	134.0	122.2	162.3
Control ...	100.0	100 0	100.0	Control ...	100.0	100.0	100.0

Table VII.

Number of Bunches per Palm. Serdang Block 5D.

Treatment	July-Dec. 1932	1933	1934	Treatment	1935	1936	1937
N P K ...	5.4	10.2	8.7	N P K ...	6.4	9.3	7.8
N P ...	4.1	9.1	9.3	P (alternate) ...	7.5	9.6	7.6
P (Rock) ...	4.7	9.7	8.8	P (annual) ...	5.8	8.5	6.8
P (Basic) ...	4.5	7.6	8.6	P (Dust) ...	6.1	9.6	7.6
Control ...	4.9	7.7	6.8	Control ...	5.1	7.5	5.4

Table VIII.

Weight in pounds of Unit Bunches per Palms. Serdang Block 5D.

Treatment	July-Dec. 1932	1933	1934	Treatment	1935	1936	1937
N P K ...	17.9	21.1	24.2	N P K ...	31.9	14.2	22.7
N P ...	15.9	18.7	20.4	P (alternate) ...	24.4	14.8	20.6
P (Rock) ...	14.4	18.2	18.5	P (annual) ...	21.6	11.9	15.9
P (Basic) ...	15.0	19.1	18.1	P (dust) ...	25.4	11.1	18.3
Control ...	13.7	16.1	17.0	Control ...	22.7	11.6	15.9

It will be seen from the above that there has been a falling off in yield on Block 5D after the cessation of manuring, but whereas in the case of Estate "A" there has been chiefly a decrease in the number of bunches, on 5D in 1936 there was a fall in the weight of bunches rather than in numbers.

Artificial Pollination on Block 5D Serdang.

As stated in the *Malayan Agricultural Journal* for 1935 page 329, artificial pollination was only properly carried out from 1934 onwards. The available figures are given in Table IX.

Table IX.

Total Yields in lbs. from Pollinated and Unpollinated Palms. Block 5D Serdang.

	1935		1936		1937 (to Sept.)		Total	
	Pollinated	Control	Pollinated	Control	Pollinated	Control	Pollinated	Control
N P K ...	10,883	9,017	14,464	16,163	10,256	10,110	35,603	35,290
P (alternate) ...	12,688	8,608	13,874	13,551	9,436	8,168	35,998	30,327
P (annual) ...	9,366	5,867	10,638	12,209	6,935	7,143	26,939	25,219
P (dust) ...	9,498	6,334	12,415	12,238	8,434	7,806	30,347	26,378
Control ...	7,231	5,866	8,225	9,263	5,050	5,308	20,506	20,437
Total ...	49,666	35,692	59,626	63,424	40,061	38,535	149,393	137,651
Mean ...	9,933	7,138	11,925	12,685	8,015	7,707	29,879	27,530

Statistical examination shewed that the differences between the yields from the pollinated and unpollinated palms is not significant, a fact which can be seen by a casual inspection of the above table.

Although the pollinated bunches consistently shew a higher percentage of fruit than the unpollinated bunches from the same palms or bunches from the control palms, these differences are not significant. The gradual decrease in the differences are of interest and suggest possibly shortage of plant foods became the limiting factor in the latter years. In view of the figures obtained and the increasing difficulty and expense with increasing height it is not proposed to continue pollination work on Block 5D.

Table X.

Mean percentages of Cleaned Fruit from Pollinated, Unpollinated and Control Bunches. Serdang Block 5D.

	"Pollinated" Palms		"Unpollinated" Palms	
Year	Pollinated bunches	Unpollinated bunches	Unpollinated	Mean
1935	65.5	50.8	52.8	56.4
1936	63.9	58.6	60.7	60.1
1937	69.1	62.2	66.4	65.9
Mean	66.2	59.9	63.3	61.2

Young Palms. Estate C.

The previous article gave the history of the young palms on Estate C. They were planted in December 1929, were first manured in July 1932 and thereafter at six monthly intervals until February 1934. They were manured again in July 1935 and this will be repeated in July 1938.

Table XI

Mean Yield per Palm in lbs of Fruit Bunches from Young Palms Estate C.

Treatment	Nov. 1932 to Dec. 1933	Calculated 1933	1934	1935	1936	1937
N P K ...	163	151	214	291	311	289
N P ...	166	154	201	274	326	299
P ...	159	147	190	246	260	260
N ...	134	125	191	249	265	223
Control ...	144	134	184	260	249	251
Random Error					52.9	33.7
"P" (.05) difference in lbs. for significance					68.4	43.6
"P" (.10) ,, ,, ,, ,, ,,					60.4	38.4

Table XII.

Yields expressed as Percentages of the Controls. Estate C.

Treatment	Nov. 1932 to Dec. 1933	1934	1935	1936	1937
N P K ...	113.2	116.7	111.9	124.7	115.1
N P ...	115.2	109.4	105.4	130.9	119.1
P ...	110.5	103.4	94.6	104.4	103.6
N ...	93.0	103.9	95.7	106.4	88.8
Control ...	100.0	100.0	100.0	100.0	100.0

Table XIII.

Number of Bunches per Palm. Young Palms Estate C.

Treatment	Nov. 1932 to Dec. 1933	1934	1935	1936	1937
N P K ...	14.7	12.6	12.4	12.5	10.3
N P ...	14.7	10.5	12.0	12.2	10.2
P ...	13.2	10.8	10.7	10.3	8.8
N ...	14.3	11.2	10.7	10.3	8.4
Control ...	13.2	11.1	12.2	9.9	8.6

Table XIV.

Weight in lbs. of Unit Bunches per Palm. Young Palms Estate C.

Treatment	Nov. 1932 to Dec. 1933	1934	1935	1936	1937
N P K ...	11.1	17.0	23.5	24.9	28.1
N P ...	11.3	19.1	22.8	26.9	29.3
P ...	12.0	17.6	23.0	25.3	29.5
N ...	9.4	17.1	23.2	25.8	26.8
Control ...	10.9	16.6	21.3	25.2	29.2

These results indicate that a combination of nitrogen and phosphate is beneficial to young palms, although at the present price of oil, profit is dubious. It may be, however, that expenditure on early manuring will be repaid in later years.

General Conclusions.

For reasons given it is impossible to draw any reliable deductions from the later stages of the experiment at Serdang. From the Estate A it may be concluded that the effect of a manurial application of phosphate ceases after 18 months and since the results of an application are not manifested before 9 to 18 months (earlier papers) it follows that applications of phosphate should be annual from approximately the 7th. year. It is still impossible to say whether nitrogen, potash, or magnesium are necessary from the 13th. year.

As an insurance measure it would seem wise to apply a complete mixture, including magnesium, at every third year from the twelfth year until more definite results are available.

Application of nitrogen and phosphate has given an increased return from young palms but time is necessary to show whether this will be commercially profitable.

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DWARF COCONUTS IN MALAYA.

Memorandum prepared by the Research Branch of the Department of Agriculture, S.S. and F.M.S. in connexion with the visit to Malaya of Sir Frank A. Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies.

As they exist in Malaya, dwarf coconuts may be broadly divided into three main varieties—yellow, red and green. The yellow variety is the most common and exhibits a number of gradations shading into red and green. The green variety, in particular, seems prone to "throw" a proportion of semi-tall palms. Varieties have been described by Handover* and Jack and Sands.†

The origin of dwarf coconuts is doubtful; Handover suggests they are mutant of "talls" appearing probably in Java, while Jack and Sands are satisfied that there is no identity with the king coconut of Ceylon. It is generally supposed that dwarfs were first introduced into Malaya between 1890 and 1900 by Javanese and Banjarese padi planters in Krian, Perak, but a quotation by Winstedt from Malayan Folklore speaks of the "Golden coconut only to be found in princes' gardens"; this suggests far earlier importation into the Peninsula.

Until 1912 the palms were grown by Malays for the sake of the fresh fruit and the possibility of copra manufacture was not considered. In that year Handover collected seed from Parit Buntar and planted 500 acres at Sungei Nipah in the Sepang District of Selangor, in 1919 he published the article mentioned above which directed attention to their commercial possibilities. In that article it was claimed that the advantages offered by dwarfs, *viz* denser planting, earlier maturity and easier harvesting counterbalanced the disadvantages of smaller nuts. As a result of observations on isolated mature trees and on Sungei Nipah in the 1st. and 2nd. years of production (4th. and 5th. years from planting) Handover estimated a yield of 21½ piculs of copra (1 picul = 133 1/3 lbs.) per acre per annum in the 9th. year from planting. It was also stated that dwarfs appeared to be exceedingly hardy and would grow well on white clay, red loam or deep peat—in fact, in any situation where water is abundant, yet not stagnant, "though it is evident that well drained alluvium suits it best". As a result of this article a number of estates laid down areas of dwarfs, generally small, but reaching 762 acres in one case (on peat). In general, a mixture of the three main varieties was planted, with yellow predominating. In 1929, Jack and Sands published another article‡ describing observations made on eighteen trees planted in 1921 around the Departmental Office at Parit Buntar, Krian. From yields of these palms and from records of estates, an estimate of 13 to 17 piculs of copra from dwarfs growing under favourable conditions were made. Subsequently it became clear that dwarfs were not hardy and that although "under favourable conditions" they were capable of exceedingly high yields, the limits of such conditions were very narrow. Further,

* The Dwarf Coconut. *Malayan Agricultural Journal* Vol. VII No. 5, 1919.

† The Dwarf Coconut in Malaya. *Malayan Agricultural Journal*, Vol. X No. 1. 1922.

‡ Observation on the Dwarf Coconut Palm in Malaya. *Malayan Agricultural Journal*, Vol. XVII No. 2. 1929.

Cooke experienced more difficulty in preparing copra of the highest quality from dwarfs than from talls. Accordingly, in 1933, an article by Cooke and Jagoe§ was published drawing attention to these facts.

Present Position.

In connexion with the present memorandum a questionnaire was sent to estates known to have planted dwarfs to the extent of 20 acres or more. Replies are summarized in Appendix A. No new facts have been elicited from the replies to this questionnaire; it is clear that under Malayan conditions, dwarfs are unsuited to peat soil and without irrigation, will not yield commercial crops on light or medium mineral soils. Very heavy soil *per se* is also insufficient for heavy yield as witness the Coconut Experiment Station, Port Swettenham, where the soil is peculiarly intractable and where yields range from 30 to 60 nuts per palm per annum, equivalent to 5½ to 11 piculs of copra per acre. If there were any probability of considerable extension of coconut planting locally the precise conditions governing success could doubtless be determined by detailing a Soils Chemist intensively to study the problem, but this does not seem to be called for at present. Departmental advice is that dwarfs should not be planted on light soil, or in dry situations and that in the first instance, experimental areas of 2 to 5 acres should be laid down.

No serious complaints against quality of copra have been received as a result of the questionnaire; the explanation may be that Cooke's adverse comment applied to preparation of super-grade copra and not to that of ordinary commercial standards.

It is unfortunate that the yellow type predominates on Malayan estates, since it requires the greatest number of nuts to make a picul of copra. Jack and Sands in their second paper give the following figures as averages:

Yellow	—	508 nuts per picul
Red	—	453 ,, ,, ,,
Green	—	407 ,, ,, ,,

The yellow type has also proved to be least resistant to unfavourable soil conditions. The red type produces particularly poor copra. The green type should undoubtedly have preference in spite of its less uniform progeny on account of hardiness and size of nut.

It is generally assumed in Malaya that dwarfs are self-pollinated and therefore are now genetically pure (with the exception of green "throws"). The appearance of families from single mother palms at the Coconut Experiment Station, Port Swettenham, supports this view, but yield records of these families present a very different picture; the coefficient of variability of the seven best families being as follows:—

§ Further Observations on the Dwarf Coconut Palm in Malaya. *Malayan Agricultural Journal*, Vol. XXI, No. 4, 1933.

No.	Family.	Mean Yield Nuts per annum	No. of palms	Coefficient of variability per cent.
121	Red ...	60.2	22	12.1
122	Yellow ...	54.2	22	36.0
123	„ ...	51.6	22	41.5
124	Green ...	37.2	17	74.0 (excluding semi-talls)
125	„ ...	41.5	20	39.7
138	„ ...	51.6	15	14.7
137	„ ...	43.7	14	25.7

It will be seen that only two families Nos. 121 and 138 exhibit uniformity of yield and the conclusion must be, either that yield is not predominantly a genetic character or that the palms are not genetically pure.

Appendix A.

Estate	Area planted	Type of soil and drainage	Cover	Date of planting	Varieties	Palms per acre	Nuts per acre	Yield of copra per acre	Cost per picul of copra of harvesting and preparation	Remarks.
	acres							piculs	$	
A	700	Varies from stiff clay to light loam well drained.	Mixed	1912-1927	Mixed	90 & 99	*1933* 3012 *1937* 1800	6.2* 3.8*	84 cents	This is the property on which the estimate of 21 piculs per acre was based. It has suffered from neglect but 10 piculs is probably its maximum capacity.
B	100	One of the early areas—no reply to questionnaire—dwarfs said to have been cut out as failures Soil, probably loam.								
C	125	No reply. Visited about 4 years ago—soil loam—yield probably 4-5 piculs.								

* Calculated from nut yield at 480 nuts = 1 picul of copra.

Estate	Area planted	Type of soil and drainage	Cover	Date of planting	Varieties	Palms per acre	Nuts per acre	Yield of copra per acre	Cost per picul of copra of harvesting and preparation	Remarks.
								piculs	$	
D	227	40 acres heavy clay 80 acres clay 107 acres organic well drained. 4′ & 6′ drains every 4-5 chains Water table 4′ dry, 2′ wet weather.	Micania dug in twice a year or Centrosema dug once	1923	Yellow with few green	90	*1933* 3120 *1937* 3310	5.2 6.9	83 cents as against 51 cents for talls.	
E	119	?	?	1923	All kinds	109	3813	7.7	71 cents	
F	80	Peaty† 3′ drain every chain. Water table 1′ in wet weather	Clean ?	1921	Mixed	90		20	1.30	
G	100	Coastal clay not particularly heavy. 4′ drains every 120′ —running into 8′ drains 10 chains apart. Water table 2-3 feet	Centrosema	1921	All three. Yellow variety predominates	109	*1931-32* 1197 *1933-34* 1105 *1936-37* 1119	21.8 20.4 19.7	80 cents Tall palms 51 cents	Copra not as crisp as that from talls. Irrigation introduced 1937.
H	59	Very heavy, 6′ drains every 120′ (Aeration drains every row).	Mixed	1919	Mixed	109	*1933* 3600 *1937* 4100	7.4* 8.5*	72 cents (calculated from figures given)	Annual yield said to be more variable than talls.

* Calculated from nut yield at 480 nuts = 1 picul of copra.

† Probably organic — not peat.

Estate	Area planted	Type of soil and drainage	Cover	Date of planting	Varieties	Palms per acre	Nuts per acre	Yield of copra per acre	Cost per picul of copra of harvesting and preparation	REMARKS.
	acres							piculs	$	
I	762	Deep peat. Good drainage	Mixed	1924?	Yellow	109	*1933* 1600 *1935* 1200 *1937* 1700	— 2.3 4.0	72 cents	
J	165	Medium heavy, 30 acres light organic. 3′ drains every 60′-5′ leads to watergrade *Periodic irrigation.* Water table 3′ dry, 1½′ wet weather	Centrosema	1920	Mostly Yellow	90	*1933* 4764 *1935* 7848 *1936* 5545 *1937* 6970	7.63 12.45 8.79 11.07	86 cents against 64 cents for talls	Noticeably more variable than talls, apparently increased dislike to light soil
K	41	Heavy loam alternate drains & irrigation channels every 88′.	Grass slashed	1920	Yellow	85	*1933* *1934* *1935*	25.9 23.6 27.0		
							1936 *1937*	20.2 27.4	62 cents *	

* Calculated from not every clear figures given.

THE GROWTH OF PEPPER ON LIVING SUPPORTS.

Prepared for publication by the staff of the Division of Agriculture, Straits Settlements and Federated Malay States.

In the Malay Archipelago the usual method of growing pepper (*Piper nigrum L.*) is to allow the vines to grow up hardwood supports. As it is usual to plant as many as 1,000 vines per acre, in order to establish a pepper plantation on a large scale a considerable supply of hardwood posts must be available. The supports require to be about 6 inches in diameter and about 14 feet long, thus allowing about 10 feet above soil level. If the cultivator does not have access to jungle land whence he can secure supplies, such posts will cost approximately 50 cents each or $500 per acre of planted pepper.

In countries such as India and Ceylon where pepper is cultivated, living standards are used. The tree selected is usually quick growing, deep rooted, able to withstand heavy and frequent pruning, and preferably leguminous. The trees most commonly used are dadap (*Erythrina sp.*), kapok (*Ceiba pentandra*), jack fruit, and mango. A leguminous tree which fulfils the above requirements in Malaya is *Gliricidia maculata*. It is readily propagated from cuttings 8 to 10 feet long which produce a luxuriance of succulent growth from the top of the cutting. The tops may be pollarded 3 or 4 times a year and will yield up to 15,000 pounds of green material which may be mulched on the surface of the soil.

At the Central Experiment Station, Serdang, in 1933, when a pepper manurial experiment was being designed, it was decided to duplicate the experiment on hardwood supports and on living supports of *Gliricidia maculata*. Rooted cuttings of pepper were planted against hardwood posts and Gliricidia during April, 1934, and the first manurial dressings were applied during September, 1935, when the plants were well established. Subsequent applications of manures were given in February, 1936, and February, 1937. During the course of the experiment the vines on the living supports of *G. maculata* were slower in establishing themselves and were slow in yielding compared with the vines on the hardwood supports. This may be partially due to the competition for the manurial dressings by the living supports. The following table gives the yields of green berries in lbs. per acre since the commencement of recording.

Means of Manurial Treatment.
Green Berries in lbs.
per acre.

	1936		1937		Totals
	Mar./June	July/Dec.	Jany./June	July/Dec.	
Hardwood supports ...	740	1,031	2,193	1,694	5,658
G. maculata supports ...	47	5	588	464	1,104

Cuttings of Gliricidia may be purchased for $1\frac{1}{2}$ cents each but could be propagated for considerably less and the cost of planting the cuttings would be approximately $20 per acre. With hardwood supports, in addition to the initial outlay of $500 per acre for the purchase of the posts, the setting of the posts in the ground is estimated to cost a further $25 to $30 per acre.

Received for publication 25th April, 1938.

SQUIRREL CONTROL IN KELANTAN

BY

R. G. HEATH,

State Agricultural Officer, Kelantan.

Squirrels are serious pests, more particularly of the coconut and fruit crops, throughout Malaya. It is possible that the measures successfully adopted in Kelantan to deal with this pest may usefully be adopted in other parts of the Peninsula.

In many parts of the Kelantan plain, damage by these pests has been effectively checked by means of control measures, organized in the first place by the villagers and subsequently extended by a measure of Government aid.

Shooting is the form of control normally practised. The control organization in each district or sub-district consists of a number of shooters, each being responsible for control work in a designated section. The shooters are nominated by the headman of the sub-district in consultation with certain Malay officials under him. The shooters provide their own guns and ammunition. They are recompensed by means of a levy, in cash or in kind, on all coconut and fruit holdings within the protected area. Levying is usually carried out by the local headmen. At present, individual sub-districts have their own ideas as to what constitutes a reasonable levy but it is hoped, in course of time, that the rates will be more standardized. The following are examples of the differing practices at present in vogue:—

Pendek.—For every coconut palm protected, the owner supplies either 3 nuts or a cash payment of 3 cents, while for every fruit tree, the fee is 20 cents. Levying normally takes place quarterly.

Panji:—For every coconut palm protected, the owner supplies 3 nuts or he may pay at the rate of $1 for every ten squirrels shot on his land. Payments are made monthly or every other month, depending on the amount of shooting that has been done.

Kebakat:—For every coconut palm protected, the owner supplies 4 nuts, while for every fruit tree he pays 20 cents. Collection normally takes place twice a year.

The period of protection normally varies with the levy; *i.e.* with a quarterly levy, protection is for a quarter. There is, however, a wide variation at present as regards both the frequency of levying, the nature of the levy, and also as to the relation between frequency of levying and period of protection.

In addition, the villagers sometimes choose their own shooters, without reference to the local headman, and the person chosen may be a local resident or from another district. The principle, however, remains the same throughout—nominated shooters reimbursed by a levy in kind.

These control measures usually succeed very well, although there are occasional disputes as to the selection of shooters, and at times, individuals are met with who refuse to subscribe to their local scheme. In these cases, pressure of opinion can usually be relied upon to rectify matters after a while.

During the past two years, Government, recognizing the value of the system, has sought both to assist and to extend it. This has been done by making available on request supplies of powder, shot and percussion caps to any headman or nominated shooter. In arranging distribution of available ammunition, the extension of the scheme is borne in mind and new areas usually receive prior consideration. The issue of further supplies is made contingent upon the production of tails sufficient to account for the utilization of the previous issue. In 1937 the Department of Agriculture issued 166 lbs. of powder, 1,097 lbs. of shot and 7,753 percussion caps, and received in return 20,144 tails. Much of this ammunition was distributed in new areas and the assistance given resulted in a number of these areas adopting the system which has now a footing in all five Districts. This progress is being continued during the current year.

In Ulu Kelantan District, a large wire trap (*jebak*) has been widely used for control purposes. These traps, which are reputed to be effective, cost about $1 and are made by certain of the Ulu people. It is probable, however, that less interest will be shewn in trapping in the more accessible parts of the District, now that shooting is being organized in this area.

Received for publication 27th. April, 1938.

Abstract.

THE CASHEW NUT INDUSTRY IN WESTERN INDIA*

In Europe cashew nuts are frequently used for decorative and flavouring purposes in the baking and confectionery trades. As "salted nuts," they are even more familiar in the United States of America. In flavour and in nutritive value, cashew nuts compare very favourably with almonds for which they are sometimes substituted in the preparation and decoration of cheaper grades of confectionery.

The cashew nut tree (*Anacardium occidentale*) is now to be found in many parts of the world. Originally a native of South America, it was introduced into Asia and Africa by early Portuguese travellers. At the present time cashew nut trees grow extensively in tropical America, from Mexico to Brazil, and in the adjacent islands of the West Indies. They flourish in the forest countries of East and West Africa and in Madagascar, in Indo-China, the Malay Peninsula, and in the Philippine Islands. Along the coastal tracts of Western and Southern India the cashew nut tree, with its luxuriant dark-coloured foliage, is common in the forested hill regions where the warm and humid atmospheric conditions favour its natural development and spread. Like its near relation, the mango tree (*Mangifera indica*), it thrives well in the vicinity of the sea and is a prominent feature of the scrub jungles of the Konkan, that interesting and fertile strip of country which forms the coastal boundary of the south-western districts of the Bombay Presidency. This tract consists of an elevated plateau, intersected by numerous rivers and creeks. It is subject to heavy rainfall, varying from 90 to 150 in. annually, all of which falls during the four monsoon months of June to September. The climate is equable during the short cold weather season, but, for the greater part of the year, hot and humid conditions prevail.

As a general rule, cashew nut trees grow wild in the Konkan forests and little or no attempts are made by the Indian cultivators to establish them in cultivated plantations.

Under favourable conditions, the cashew nut tree, though somewhat ungainly in habit, grows to a height of 20 to 30 ft. and bears a thick foliage of dark coloured broad leaves. In the Konkan tract it flowers in January or February, and the peculiarly-shaped fruits ripen about two months later. Fruit-bearing commences at the end of the third year. The true fruit or cashew nut attains its full size in a very short time and can be seen hanging from the branches in dark green clusters. After the formation and ripening of the nut, the stalk or peduncle of each nut gradually swells and assumes a fleshy, turgid appearance, somewhat resembling an overripe apple. This cashew "apple" matures to a bright red or yellow colour, a striking contrast to the dark olive-green nut which projects as a kidney-shaped excrescence from the apex of the rounded and pulpy "apple." These cashew

* Abstracted from an article by W. J. Jenkins, M.A., B.SC., I.A.S., Acting Director of Agriculture, Bombay Presidency, published in the Bulletin of the Imperial Institute Vol. XXXVI No. 1, 1938.

"apples" are collected by hand in April or May and the nuts are separated from the swollen stalks in the huts of the villagers. In the Konkan a mature cashew nut tree of eight to ten years old will yield from 100 to 150 pounds of "apples" annually, from which about 20 to 25 lb. of unhusked nuts are obtained. The local value of the produce of a well-grown tree is approximately Rs. 2 to Rs. 2-4, or about 3s. 6d.

After the cashew nuts have been collected they have to undergo several processes before they are ready to be marketed as the "blanched cashew kernels" of commerce. The most important of these after-treatments is roasting, which not only facilities the extraction of the kernel from the hard, outer husk, but which also renders the kernel more palatable and fit for human consumption. In the jungle villages primitive methods of carrying out this process have been in use for many years. The entire nuts are placed in earthenware pots which are perforated on the base to permit the escape of the pungent, astringent oil released from the husks during the roasting treatment. These pots, each containing about 1½ to 2 lb. of nuts, are balanced on three stones over a slow burning fire, fed with dry cowdung fuel and dead leaves. While heating, the nuts are stirred with wooden ladles and the expelled oil, which drains through the holes in the base of the pot, is collected in an iron spoon After about 10 minutes roasting the nuts are ready for separation. They are placed in a basket and sprinkled with wood ash, so that the oil with which they are covered will not adhere to the hands of the workers. This precaution is very necessary as the oil contained in the husks, and given off during the roasting, is injurious on account of its blistering property, due to the presence of an astringent substance known as "cardole," which has a similar action to crude carbolic acid on the human skin. The husks are then cracked between two stones and the kernels are extracted by hand. No efficient mechanical device for this separation has yet been evolved in spite of the development of the cashew nut industry on a factory basis in several centres of the district. In the adjoining regions of Kanara and Portuguese India, *i.e.* Goa, a method has been adopted whereby the cashew nuts are roasted in hot sand prior to the extraction of the kernels. This process results in a greater percentage of oil being left in the kernels than by the "pot" method. Consequently, kernels roasted by the "sand" method are never so sweet or palatable as those prepared by the original and more primitive village system.

In the Konkan districts of the Bombay Presidency, and in the adjoining Portuguese territory of Goa, several factories have now been established for the large-scale preparation of cashew nuts for export markets. As the local supplies are at present inadequate for factory requirements, large imports of raw, unhusked cashew nuts are made each year from Mozambique, Zanzibar, and the East African ports for processing in the Indian factories.

On arrival at the factory the nuts are roasted in large open pans or in perforated rotary drums suspended over flaming fires fed with the oily and inflammable dry husks as fuel. This roasting process lasts from one to two minutes and about 8,000 lb. of nuts are roasted in each pan daily. When the rotary drum method is

used, the nuts are soaked overnight in water before being fed into the drums next day for roasting. This preliminary soaking softens the hard outer shell and enables the roasting to be done without burning the nuts, which often occurs in the "open pan" system. The drums are 12 ft. long and 3 ft. in diameter and are usually made of galvanized iron sheeting. They are geared to a turning mechanism worked by hand and are fixed in a sloping position above the furnace. During roasting the nuts are fed in continuously at the upper end of the cylinder, which is revolved rapidly or slowly according to the intensity of the fire. As the drum revolves the nuts gradually roll through the interior, getting adequately roasted on the way, and are finally discharged from the open lower end. The pungent oil which is given off by the husks during roasting drains into a separate collecting receptacle. The roasting room is full of the oily smoke and acrid smell of the burning husks which have a most unpleasant effect on the nose and eyes of the unseasoned visitor.

After roasting, the nuts are dusted with wood ash and removed in flat, shallow baskets to a large shed where the husks are broken open and the kernels extracted. This work is done entirely by women and girls, who squat on the floor and crack the roasted nuts with small wooden batons on flat stones embedded in the ground in front of them. Considerable skill is required to carry out this operation quickly without damaging the kernels and thereby reducing to a very great extent their commercial value. Twenty-five lb. of unhusked nuts yield from 6 to 8 lb. of kernels. The kernels, when extracted, are covered with a thick yellow skin which must be removed before packing for export. To facilitate the removal of this outer integument, the kernels are subjected to baking in drying chambers at a temperature of 70°C. for four to six hours. As a result of this treatment the yellow outer skin dries up and shrivels and can be easily and completely removed by hand, leaving the ivory-white and shining surface appearance desired by the trade. During this drying process the kernels become brittle and would easily be damaged and broken in packing and transport. Accordingly they are now subjected to a "sweating" treatment which is carried out with the object of enabling the dried kernels to absorb moisture and thus prevent excessive breakage and chipping in subsequent handling. For this purpose the kernels are spread out in a single layer on long flat trays, which are placed in "sweating chambers" over small tanks of water. The necessary moisture is absorbed by the kernels after about two or three hours of this treatment, when they are removed to another part of the factory for grading and packing for export. The kernels are graded by skilled female labour, according to size, and are then packed in tins, each containing 25 lb. of kernels. The air contained in the packed tins is exhausted by means of a vacuum pump and replaced by carbon dioxide to prevent the subsequent development of moulds on the produce.* The tins are then hermetically sealed, labelled, and packed in wooden crates for export.

* We understand that in East Africa the air is exhausted by means of an ordinary tyre pump arranged for this purpose, and that there is no replacement of the air by carbon dioxide. This process is stated to be sufficient to keep the nuts in good condition—*Ed. M.A.J.*

The great bulk of the production of Indian "blanched cashew kernels" is exported to the United States of America. About 15,000 tons of raw, unhusked nuts are imported into India annually for preparation in the Indian factories and are re-exported along with the locally-grown produce. Such imports are mainly from Portuguese East Africa, Kenya Colony, and the Union of South Africa. In 1934-35 the export of "blanched cashew kernels" from India to America was approximately 5,300 tons, which increased in 1935-36 to 7,700 tons. Exports to the United Kingdom and to the Continent in these two years did not exceed 270 and 750 tons respectively, and, accordingly, it is obvious that the industry depends at present almost entirely on the demand of the America consumer. The annual export of cashew nuts from India represents a cash value of over 50 lakhs of rupees, *i.e.* £385,000, and the industry gives employment to 10,000 to 15,000 people during the season.

The cashew "apple" in India has been used for the illicit distillation of an intoxicating liquor. Experiments to prepare a vinegar from the "apple" have not given much promise of economic utilization in this direction.

The cashew oil, which is extracted from the shells of the raw nuts during the process of roasting, has many valuable uses. At one time it was employed only by the natives, but much work has been done in recent years with a view to its industrial utilization. Processes have been devised for using it in the preparation of different kinds of varnishes, insulating coatings, moulding compositions, inks, etc. During 1936 large quantities of the oil were exported, principally to the United States and Germany, and one company with factories near Quilon is planning to produce 200,000 gallons of shell oil annually. In view of the growing demand for the oil new methods for its extraction are being developed so as to prevent the large wastage incurred in the ordinary treatment of the nuts.

In India, where the shell oil is sold locally at the rate of Rs. 1-8-0 per maund of 28 lb., it is in demand as a lubricant for country boats and has the valuable property of preventing damage by white ants when painted on furniture, books, and similar perishable articles. The oil is also used by fishermen as a preservative for their nets. The villagers maintain that cashew shell oil is a valuable specific against leprosy, that dreaded scourge of the East, and there is evidence from medical men in the districts that the oil is efficacious in the treatment of this disease.

The resinous gum exuded from the bark of the tree has well-known insecticidal properties and is also used as a tanning agent. The sap obtained from incisions in the bark is utilized as an indelible marking ink. Finally, the wood of the tree is a common fuel in the regions where it is obtainable, and it is also utilized for the manufacture of country boats, packing cases, and in the preparation of charcoal.

MALAYA AND TEA RESTRICTION.

In reply to a question at the meeting of the Federal Council of the Federated Malay States held on 30th. June, 1938, the Adviser on Agriculture (the Hon'ble Mr. O. T. Faulkner, C.M.G.) reviewed the history of Malayan participation in tea control and the position regarding negotiations with the International Tea Committee. He stated:—

"Under the first Tea Restriction Agreement, which terminated on 31st. March this year, Malaya was allowed to plant up to a total of 6,000 acres. As soon as the necessary legislation was passed permits were issued, at the beginning of 1937, to everyone who wished to plant and was able to do so, but owing to the short time available the amount actually planted from January 1st. 1937, to March 31st. 1938, was only 1,272 acres, making the total planted area 4,716 acres on the latter date.

"In the big tea growing countries the preliminary negotiations with the Internatonal Tea Control Committee—itself an unofficial body—were conducted by representatives of the Tea Planters' Associations of those countries, so that in due course agreed proposals were submitted to the Governments concerned for consideration. But in Malaya at that time there was in no sense any body of tea planters who could thus negotiate with the International Committee. Your Excellency had, therefore, to conduct all the negotiations through the Malayan Information Agency on behalf of all the Malayan Governments; though those persons who had already planted tea in Malaya were consulted as fully as was possible in the circumstances.

"When the new Agreement, to start on April 1st. this year, came to be considered the same course was followed and Your Excellency made to the International Tea Committee a demand that we should be allowed, in Malaya, to plant up to a total of at least 10,000 acres in all by the end of the agreement, i.e. by 31st. March, 1943. This was a minimum figure and it was indicated that more might be demanded in certain circumstances. In support of this demand, Your Excellency put forward, through your representative, a case which I personally considered to be both extremely strong and at the same time entirely reasonable. But the International Tea Committee, after first proposing that we should be allowed no increase at all beyond the 6,000 acres already mentioned, eventually made an offer of only 7,000 as the total to be allowed to be planted by the end of the Agreement, *i.e.* by the 31st. March, 1943. At the same time the United Planting Association of Malaya approached the Federal Secretary, stating that it considered that our minimum demand should be for 15,000 acres over and above whatever the area actually planted might be on March 31st. 1938, *i.e.* roughly a total of 20,000 acres by March, 1943.

"In these circumstances, Your Excellency decided that the best course was to ask the United Planting Association of Malaya to form a Tea Planters' Section or Committee and to request that Committee to conduct the further negotiations with the International Tea Committee, appointing its own representative in

London for the purpose. Your Excellency suggested that I should be invited to attend all meetings of the local Committee to act as liaison officer. The United Planting Association of Malaya agreed to this course and duly formed a Committee, of which I attended the only meeting that has as yet been held. The Committee decided to ask Mr. J. G. Hay, a director of Messrs. Guthrie & Co. Ltd., who attended the meeting, to act as their representative in this matter; and in subsequent correspondence the Government assured the United Planting Association that it would support Mr. Hay's representations on behalf of Malaya; although naturally the Governments of Malaya, like those of all the other tea-growing Colonies, reserve the right to accept or reject the results of the negotiations between the unofficial representatives of the industry in Malaya and the International Tea Committee. Mr. Hay unfortunately fell sick at Singapore on his way home so that his departure to England was delayed by some weeks.

"In the meantime, in order that planting should not be held up, and also in view of the desirability of clearing being carried out at an early date in order to provide employment, I informed everyone who had already planted tea on anything more than an entirely petty scale and also anyone believed to be likely to do so, that I would consider applications for permits to plant during 1938 and that I would issue permits for planting which would automatically expire on the 31st. of December, 1938. Under this temporary arrangement applications have been received for permits to plant 1,674 acres and permits for the planting of this area have been issued, so that the total area which is now planted or permitted to be planted before 31st. December, 1938 is 6,380 acres."

Departmental.

OBITUARY.

JOHN HORACE DENNETT, B.SC.

It is with profound regret that we record the death of Mr. John Horace Dennett which took place at Kuala Lumpur on 14th. June, 1938.

Mr. Dennett was born in 1899 and educated at King Edward VI School Birmingham, and later at Birmingham University where he obtained the degree of Bachelor of Science.

In 1921 he was appointed Assistant Agricultural Chemist, Department of Agriculture, S.S. and F.M.S., and in 1935 was promoted to Soils Chemist, a post which he held at the time of his death.

Mr. Dennett's early research work was mainly concerned with the commercial aspects of nipah palm cultivation, but in the scientific sphere he will be best remembered for his valuable work on Malayan soils.

Those who were closely connected with his work recognised his abilities. Unhurriedly he persued the course of his investigations and would not commit himself before he had satisfied his own high standard of reliability. He possessed the right temperament for research work, and his untimely death robs us of an investigator whose future career was full of promise.

During the Great War he served with the Royal Naval Air Service and the Royal Navy; and also saw active service with the Tank Corps. In Malaya he closely associated himself with the volunteer movement and commanded the F.M.S.V.F. Light Battery with the rank of major.

Mr. Dennett's personality commanded the affection and respect of all those who were privileged to be amongst his intimates. Of these his colleagues in the Department of Agriculture counted themselves and his passing away has cast a gloom which will not pass lightly. He will be long remembered by us, and by his friends outside the Department; and our sympathy is extended to his wife and daughter in their bereavement.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

June, 1938.

The Weather.

The weather throughout the country was abnormally hot and dry during the month. At only a few isolated centres did the rainfall approach normal.

In Kedah and northern Perak storms occurred towards the end of the month which to a certain extent mitigated the dry conditions. In Selangor, however, the drought persisted and it was reported from some of the coastal villages that there was a shortage of drinking water.

In Negri Sembilan some heavy rain was experienced in the coastal districts, but the total precipitation was below average.

Remarks on Crops.

Rubber.—The price of rubber appreciated steadily towards the end of the month, the highest and lowest prices for smoked sheet being $27.50 and $21. The value of coupons rose also to a maximum of about $19 per picul equivalent.

Despite the increase in price the number of holdings out of tapping increased in many districts, owing to the fact that the owners were engaged in harvesting the fruit crop or working in the padi fields. Johore similarly reports a decrease in the holdings in tapping and the small-holders' lack of interest in the preparation of good quality smoked sheet is very evident. In the Northern Circle not one of the new smoke cabinets was in operation during the month.

The Rubber Dealers' Union of the Temerloh District in Pahang has issued, with the approval of the State Agricultural Officer, to all small-holders about 10,000 copies of an instructional circular on the preparation of good quality sheet rubber. These pamphlets are being distributed from the dealers' shops and are also posted at conspicuous places throughout the District.

Padi.—The dry weather has interferred to a certain extent with padi planting, particularly where adequate irrigation facilities do not exist.

The price being paid for padi at the Government Rice Mill in Krian remains at $2.10 per picul. The total quantity of padi purchased by the Mill this season has reached 153,000 piculs. The inspection and sealing of sacks of S.48 for the 10 cent bonus paid by the Mill has now been completed and a total of 97,000 sacks were sealed during the season, an increase of 9,000 over last year.

At the Temerloh rice mill a total of 3,608 piculs of padi have so far been handled which is a record for the mill. Buying is now decreasing but it is expected that a further quantity of several thousand gantangs which is at present being held in the various mukims, will come to the mill when the planting of new season's crop has been finished.

Many small privately-owned rice mills have lately started work in Kedah. This has undoubtedly done much to increase the prices paid for padi, which in previous seasons have tended to be low.

The harvest is now everywhere completed.

In Johore the Drainage and Irrigation Department has commenced work on the irrigation of rice fields in the Tenglu area. A scheme has also been drawn up for the irrigation of two comparatively large areas in the vicinity of the Sungei Tenglu.

Coconuts.—The price of copra remained low and it appears that in some places there is a reversion to the old practice of sale of nuts to Chinese dealers, rather than to prepare copra on the holding.

Fruit.—Rambutan, mangosteen and durian are now in season and bumper crops are being harvested in many districts. Prices, however, have been very low—due probably to the decreased purchasing power of the community.

It is reported that in Province Wellesley and Penang mangosteens are only being harvested from easily accessible trees. On the hill and in out-of-the-way orchards the fruit is being left to rot, as the price is too low (30 cents per 1,000) to pay for harvest and transport.

Livestock.—The live weight price of pigs fell to unusually low levels, $11 per picul being the lowest price quoted in Penang. The price in Selangor was $14 to $16.50. The market price of pork has not shown a decrease.

Pineapples.—The price of fresh fruit remains at the low levels previously quoted, 60 to 70 cents per 100 for 1st quality being the price paid at factories in South Johore. There is little or no sale for the lower grades and considerable wastage on this account continues to be reported. As a result of the uneconomic position, upkeep on holdings is badly neglected. The price realized for the canned product has not improved.

Penghulus' Courses.—Penghulus' courses were held in the Central, North and Southern Districts of Malacca and were attended by a total of 119 Penghulus and Sidangs. The courses were very comprehensive and included instruction on the preparation of sheet rubber, budding and care of fruit trees, planting of Guinea grass for buffalo fodder, compost making and poultry keeping.

DEPARTMENTAL NOTES.

Appointments.

Mr. B. G. A. Lowe, Botanist, Department of Agriculture, S.S., and F.M.S has been appointed to be an Agricultural Officer, Department of Agriculture, S.S and F.M.S. with effect from 1st March, 1938, inclusive.

Mr. R. G. H. Wilshaw, Chemist (Soils) has been appointed to act as Senior Chemist (Soils) consequent upon the death of Mr. J. H. Dennett.

Leave.

Mr. H. L. Barnett, Assistant to Agricultural Economist, has been granted 250 days' leave with effect from 4th June, 1938, inclusive.

Mr. A. de K. Frampton, Agricultural Officer, has been granted 217 days' leave with effect from 17th June, 1938, inclusive.

Mr. F. Birkinshaw, Chief Field Officer, has been granted 237 days' leave with effect from 2nd. July, 1938, inclusive. During his absence on leave, Mr. A. E. Coleman-Doscas, State Agricultural Officer, Johore, will act as Chief Field Officer with headquarters at Kuala Lumpur.

Mr. C. W. S. Hartley, Agricultural Officer, returned from leave on 3rd. June, and proceeded to Malacca to take over the duties of Agricultural Officer, Malacca.

TRADE ENQUIRIES FOR DERRIS.

A firm in New York desires to be placed in touch with estates in Malaya who expect to be harvesting Derris Changi No. 3 in the near future. The firm in question, however, is not in a position to contract in advance for the entire output of an estate, as they are compelled by trade considerations to purchase at the current market price.

(Ref. 32 A in D.A. 515/37).

A firm in the United Kingdom states that although they have contracted ahead for fair quantities of derris root, they have not fully covered their requirements and are quite prepared to consider offers of suitable derris root. The firm is not interested in small quantities such as 1 or 2 tons of root, but wish to be placed in touch with supplies of quantities of the order of 20 tons or more.

(Ref. 34 in D.A. 515/37).

FERTILIZER PRICES, JUNE, 1938.

The following are the prices at the end of June, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	50.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

Statistical.

MARKET PRICES.

June, 1938.

Major Crops.

Rubber.—Prices shewed a steady improvement during the month. Spot loose opened at $19\frac{1}{4}$ cents per lb., dropped two days later to $18\frac{1}{2}$ cents, the lowest price reached during the month, and then gradually improved, to close the month at $23\frac{5}{8}$ cents per lb., the highest price being $23\frac{3}{4}$ cents on 29th.

The average price for the month of No. 1. X. Rubber Smoked Sheet was 20.27 cents per lb., as compared with 18.96 cents in May. The London average price was 6.06 pence per lb., and the New York price 12.36 cents gold, as compared with 5.68 pence and 11.49 cents gold in the previous month.

Prices paid for small-holders' rubber at three centres during June are shewn in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, May, 1938.

(Dollars per Picul.)

Grades	Kuala Pilah, Negri Sembilan				Kuala Kangsar, Perak				Batu Pahat, Johore				
	2	9	16	30	8	15	22	29	1	8	15	22	29
Smoked sheet ...	22.00	22.60	23.38	28.00	22.00	21.94	24.00	24.79		21.10			26.00
Unsmoked sheet ...			21.50		19.64	17.00		24.00	19.50	19.30	20.30	22.80	25.00
Scrap ...	No purchases												

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchase at Kuala Kangsar on 1st June, or at Kuala Pilah on 23rd June.

Palm Oil.—The price of palm oil dropped £1 early in June over the last quoted price in May, but recovered this price at the end of the month. Palm kernels weakened over May prices. Quotations during June are given in Table II.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c i.f. landed weight London/ Continent
		per ton	per ton
June	3	£ 13. 0. 0	£ 8. 12. 6
,,	10	13. 0. 0	8. 12. 6
,,	17	13. 10. 0	8. 15. 0
,,	24	14. 2. 6	8. 12 6

Copra.—Copra, which weakened towards the end of May shewed a slight improvement during the first part of the month of June. In the middle of the month it was inclined to sag, but recovered during the last week.

The average price of the sun-dried grade was $3.37 per picul, as compared with $3.71 in May. The Mixed grade averaged $3.04 per picul as compared with $3.31 in May.

Copra cake was quoted throughout the month at $2.10 per picul, as compared with an average of $1.88 per picul in May.

Rice.—The average wholesale market prices of rice per picul in May were as follows:—Siam No. 2 (ordinary) $4.16, Rangoon No. 1 $3.90, Saigon No. 1 $3.92; as compared with $3.98, $3.62 and $3.85 in April and $4.21, $3.62 and $3.60 in May 1937.

The average retail prices in cents per gantang of No. 2 Siam rice remained unchanged: Singapore 28, Penang, 32, Malacca 28.

The average declared value of imports during May was $3.92 per picul, as compared with $3.91 in April and $3.89 in March.

Padi.—The Government Rice Mills, Perak, continued to pay $2.10 per picul for padi. The price in the larger padi-growing districts was generally around $8.00 to $8.50 per 100 gantangs. In most of the smaller padi-growing districts the average price was around $9 per 100 gantangs, while in non-padi growing districts and in towns the price range was from $10 to $14.50 per 100 gantangs.

Pineapples.—A further decline in prices over last month of about 15 cents per case for all grades of canned pineapples is recorded at the end of June. The following are the average prices per case of 48 tins of 1½ lbs. each:—G.A.Q.: Cubes $2.60, Sliced flat $2.55, Sliced Tall $2.70; Golden Quality: $2.75, $2.70, and $2.85 respectively.

Fresh pineapples at Singapore factories were from $1.30 to 50 cents per 100 fruits, the price within the range depending on quality. In South Johore the prices were 1st quality $1 20 to 66 cents, 2nd quality 60 to 40 cents, 3rd quality 30 to 55 cents. North Johore prices tended to be rather higher. In Selangor pines from small holdings were from 25 to 50 cents per 100, from estates 40 to 60 cents per 100.

Beverages.

Tea.—Eleven consignments of Malayan tea comprising a total of 950 packages were sold on the London Market during June. Four consignments (330 packages) were upland tea and seven consignments (620 packages) were lowland tea. The upland tea sold at prices between 1s. 2¾d. to 1s. 1¼d. per lb., the average price being 1s. 1.94d., while the prices obtained for the lowland tea varied from 1s. 1d. to 11¾d., the average price being 1s. 0.25d. per lb.

Average London prices per lb. during June for consignments of tea from other countries were as follows:— Ceylon 1s. 2.34d., Java 1s. 0.56d., Indian Northern 1s. 1.81d., Indian Southern 1s. 1.72d., Sumatra 11.06d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report,* 28th June, 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 77 cents, Medium Grown Teas 67 cents, Low Grown Teas 60 cents.

Coffee.—Palembang coffee prices varied but little averaging $11.85 to $13.10 per picul depending on quality, while Sourabaya coffee was steady at prices averaging $6.70 to $8.65. The May averages were $11.12 to $13.12 and $9.19 to $10.19 per picul.

Prices in Singapore of other varieties of coffee were as follows (per picul):— Liberian $14 rising to $14.50; Excelsa $9 rising to $9.50; Robusta $6.50 dropping to $6.00.

Spices.

Arecanuts.—The improvement in prices recorded in the previous month were generally well maintained in June. The range of Singapore prices—depending on quality—during the month were as follows:—Splits $4.26 to $7.29; Red Whole $4.50 to $6.25; Sliced $4.30 to $9.10 per picul.

The average of the Singapore Chamber of Commerce quotations per picul were lower than those recorded in May; they were:—Best $6.96, Medium $6.44, Mixed $5.87.

Pepper.—Prices declined in June for all grades of pepper. Average prices per picul in Singapore were as follows:—Black $8.06, White $13.44, Muntok $13.69 as compared with $8.25, $13.69 and $13.94 respectively in May.

Nutmegs.—Both 110's and 80's were quoted throughout the month at $30 per picul.

Mace.—Siouw mace stood at $90 per picul for the first half of the month and then dropped to $82, while Amboina similarly dropped from $74 to $68. Average Singapore prices per picul in June were $86 and $71 respectively, as compared with $90 and $74 in May.

Cloves.—Little interest was shewn in this product and nominal prices for both Zanzibar and Amboina cloves were quoted at $40 per picul.

Cardamoms.—Latest available price of green cardamoms as given in the Ceylon Chamber of Commerce Weekly Report of 27th June is from Rs.1.20 to Rs. 1.32 per lb.

Miscellaneous.

Derris.—Fair supplies are still available owing to lack of orders from abroad, and prices have further declined. Average prices in June for root sold on a basis of ether extract $14 per picul; root sold on rotenone content $22 per picul.

Gambier.—Gambier prices in Singapore remained steady at Block $7.50 and No. 1 Cube $15.50 per picul.

Tapioca.—The price of Flake Fair dropped to $4.10 per picul in mid May and was quoted at this price throughout June. Seed Pearl which dropped to $4.00 per picul in mid May, fell another 10 cents a month later; the average price of this grade in June was $3.95, as compared with $4.12 in May. Medium Pearl was quoted throughout June at $4.75, a price it has held since the middle of May.

Sago.—Singapore prices of sago shew an improvement in June over those of the latter half of May; average prices were Pearl, Small, Fair $3.56, Flour, Sarawak, Fair $1.79 per picul as compared with $3.61 and $1.95 in May.

Tobacco.—In Perak, where there is a flourishing trade in the manufacture of cheroots, uncured leaf was sold from $6 to $4.50 per picul, while the general range of dried leaf was (per picul):— 1st quality $40 to $34, 2nd quality $36 to $27, 3rd quality $26 to $15. Kedah prices of three grades were I $40.50 to $45, II $26 to $30, III $18 to $20. Prepared tobacco in Kedah was quoted at I $130, II $105, III $85. Negri Sembilan prices varied from $55 to $15 according to grade. In Johore prices varied considerably in different districts, Javanese types being from $50 to $70 and Chinese types $32 to $36. Dried leaf in north Johore was from $20 to $50 and prepared $75 to $95.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs. Kohyei & Co., and Messrs. Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY*

May, 1938.

Malaya.—Imports of foreign rice during May amounted to 64,596 tons†, and exports to 18,171 tons, net exports being 46,425 tons as compared with 45,169 tons in 1937.¶

Of the imports during May, 44 per cent. were consigned to Singapore, 21 per cent. to Penang, 7 per cent. to Malacca, 22 per cent. to the Federated Malay States, and 6 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):— Siam 38,551 (59.7), Burma 22,843 (35.4), French Indo-China 2,130 (3.3), other countries 1,072 (1.6).

Of the exports during May, 84 per cent. were consigned to the Netherlands Indies and 16 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 11,874 (65.4), Burma 5,706 (31.4), French Indo-China 507 (2.8), parboiled 42 (0.2), local production 42 (0.2).

India and Burma.—Exports from India during the first four months of the year amounted to 98,000 tons, as compared with 553,000 tons in 1937 a decrease of 82.3 per cent. Of these exports, 4.1 (4.5) per cent. were to the United Kingdom, 8.1 (6.9) to the Continent of Europe, 33.7 (26.0) to Ceylon, 5.1 (24.8) to the Straits Settlements and the Far East, and 49.0 (37.8) to other countries. The percentages in brackets are for the corresponding period in 1937.

Burma's exports from 1st. January to 25th. May totalled 1,689,252 tons, an increase of 5.0 per cent. when compared with the previous year's figures of 1,609,086 tons. Of these exports 41.7 (47.6) per cent. were to India, 9.3 (8.1) to the United Kingdom, 7.7 (6.1) to the Continent of Europe, 10.4 (10.5) to Ceylon, 14.0 (12.3) to the Straits Settlements and the Far East and 16.9 (15.4) to other countries. percentages in brackets are for the corresponding period in 1937.

Siam.—Exports of rice and rice products from Bangkok during March were 145,665 tons, as compared with 89,847 tons in 1937. Total exports for the first quarter 1938 totalled 413,070 tons as compared with 301,294 tons in 1937.

Japan—According to the *Trans-Pacific Journal* of 19th. May, 1938, stocks of rice in Japan on 1st. May amounted to 5,189,280 tons, representing a decrease of 56,604 tons, or 1 per cent. as compared with the same period of last year.

On the basis of 1st. May rice stocks, the supply and demand relations of rice during the 6 months ending 31st. October 1938, the between-seasons, are estimated as follows (in '000 tons):—

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* Abridged from the Rice Summary for May 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Supply		Demand	
May 1 Stocks	5,189	Estimated consumption	4,909
Estimated imports from abroad	32	,, exports abroad	5
Estimated imports from Korea	603	,, ,, to colonies	36
Estimated imports from Formosa	393		
Total	6,217	Total	4,950

Stocks at between-seasons 1,267.

French Indo-China.—Entries of padi into Cholon during the first five months of 1938 totalled 615,712 tons, as compared with 723,097 tons in 1937, a decrease of 14.9 per cent. Exports of rice during the same period were 581,970 tons as compared with 646,346 tons in 1937, a decrease of 10.0 per cent.

The Netherlands Indies.—According to the *Netherlands Indies Economic Bulletin* Vol. VI No. 1 January 1938, issued by the Department of Economic Affairs, the production of the 1937 rice crop of Java and Madoera remained practically equal to that of the record rice year 1936. Figures for the year 1937 and for preceding years are as follows (in '000 tons):—1937 (provisional) 3,778, 1936 3,777, 1935 3,630, 1934 3,340, 1933 3,558, 1932 3,510.

The area harvested under rice in Java and Madoera during 1937 amounted to 9,546,550 acres, as compared with 9,566,310 acres for the preceding year, a decrease of 0.2 per cent.

Imports in 1937 were 8,426 tons to Java and Madoera and 165,212 tons to the Outer Provinces, as compared with 8,466 and 220,633 respectively in 1936. Exports from Java and Madoera in 1937 were 16,832 tons to other countries and 193,992 tons (mainly foreign rice) to the Outer Provinces. Corresponding figures for 1936 were 11,726 and 100,359 tons.

Ceylon.—Imports during the first five months of 1938 totalled 237,229 tons as compared with 228,847 tons in 1937, an increase of 3.7 per cent. Of these imports 16.3 (15.8) were from British India, 72.1 (70.3) from Burma, 0.4 (0.1) from the Straits Setltements, and 11.2 (13.8) from other countries. Percentages in brackets are for 1937.

Europe and America.—Shipments from the East to Europe from 1st. January to 13th. May totalled 458,625 tons, as compared with 514,932 tons in 1937, a decrease of 10.9 per cent. Of these shipments, 61.3 (49.4) per cent. were from Burma, 24.9 (40.6) per cent. from Saigon, 11.1 (6.9) from Siam, and 2.7 (3.1) from Bengal. The 1937 percentages are in brackets.

Shipments for the Levant from 1st. January to 13th. May were 15,762 tons as compared with 6,470 tons in 1937, an increase of 143.6 per cent. Shipments for Cuba, West Indies and America from 1st. January to 11th. May were 81,703 tons, as compared with 102,239 tons in 1937, a decrease of 20.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, MAY, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./May 1937	Jan./May 1938	May 1937	May 1938
Arecanuts ...	30,084	13,334	17,743	1,567	3,766
Coconuts fresh † ...	95,223†	32,979†	36,414†	6,149†	6,231†
Coconut oil ...	39,762	14,553	17,585	2,882	3,069
Copra ...	75,592	22,310	14,987	4,791	2,545
Gambier, all kinds ...	1,955	850	612	173	103
Copra cake ...	15,026§	5,810	2,386	1,419	298
Palm kernels ...	7,312	2,530	3,592	515	807
Palm oil ...	42,787	16,289	20,599	3,134	4,084
Pineapples canned ...	80,502	36,432	33,689	8,780	6,781
Rubber ¶ ...	503,127¶	181,608¶	165,449¶	35,412¶	29,481¶
Sago,—flour ...	15,478	8,441	2,219	177	87
,, —pearl ...	3,759	1,339	1,699	221	324
,, —raw ...	8,256*	3,098*	2,767	538*	435*
Tapioca,—flake ...	1,058	495	126	84	446*
,, —flour ...	2,393*	882*	1,368	71	106*
,, —pearl ...	18,786	7,094	6,708	1,712	1,476
Tuba root ...	573	262	165	48	34

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March ...	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May ...	1,491.7	1,480.7	274.8	258.0
Total ...	10,097.1	7,212.7	1,829.3	1,313.0
Total January to May, 1937 ...	8,703.5	6,712.6	1,608.5	1,133.2
Total for the year 1937 ...	**27,733.5**	**17,932.8**	**5,094.7**	**2,811.4**

Stocks on estates as at 31st May, 1938 were: palm oil 1,914 tons, palm kernels 454 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST MAY, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of tappable rubber not tapped: Estates which have entirely ceased tapping: Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Percentage of (7) to (2)	Under rotational systems: Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,385	23,011	53.1	662	1.5	11,368	26.2	8,344	19.2	403	0.9	20,374	46.9
Malacca ...	122,036	68,139	55.8	2,344	1.9	21,902	18.0	29,651	24.3	2,110	1.7	53,897	44.2
Penang ...	2,488	1,300	52.2	258	10.4	870	35.0	60	2.4	36	1.4	1,188	47.8
Singapore ...	32,391	17,443	53.8	3,551	11.0	6,692	20.7	4,705	14.5	103	0.3	14,948	46.2
Total S.S. ...	200,300	109,893	54.9	6,815	3.4	40,832	20.4	42,760	21.3	2,652	1.3	90,407	45.1
F. M. S.—													
Perak ...	287,042	175,502	61.1	4,798	1.7	52,422	18.3	54,320	18.9	7,070	2.5	111,540	38.9
Selangor ...	325,640	215,979	66.3	6,262	1.9	39,990	12.3	63,409	19.5	6,370	2.0	109,661	33.7
Negri Sembilan ...	254,367	158,523	62.3	6,800	2.7	38,106	15.0	50,938	20.0	7,670	3.0	95,844	37.7
Pahang ...	86,514	54,757	63.3	2,530	2.9	17,836	20.6	11,391	13.2	6,526	7.5	31,757	36.7
Total F.M.S. ...	953,563	604,761	63.4	20,390	2.1	148,354	15.6	180,058	18.9	27,636	2.9	348,802	36.6
U. M. S.—													
Johore ...	475,753	315,001	66.2	7,078	1.5	82,543	17.3	71,131	15.0	33,602	7.1	160,752	33.8
Kedah ...	197,237	128,438	65.1	5,520	2.8	24,109	12.2	39,170	19.9	6,057	3.1	68,799	34.9
Kelantan ...	31,220	21,888	70.1	263	0.8	5,081	16.3	3,988	12.8	2,147	6.9	9,332	29.9
Trengganu (b) ...	4,817	3,214	66.7	nil	nil	74	1.5	1,529	31.8	74	1.5	1,603	33.3
Perlis (c) ...	1,371	858	62.6	216	15.8	257	18.7	40	2.9	84	6.1	513	37.4
Brunei ...	5,426	2,989	55.1	nil	nil	1,620	29.8	817	15.1	557	10.3	2,437	44.9
Total U.M.S. ...	715,824	472,388	66.0	13,077	1.8	113,684	15.9	116,675	16.3	42,521	5.9	243,436	34.0
Total MALAYA ...	1,869,687	1,187,042	63.5	40,282	2.1	302,870	16.2	339,493	18.2	72,809	3.9	682,645	36.5

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYA RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MAY, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealers	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: Jan. to May 1938	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: Jan. to May 1938	Imports during the month: Foreign	Imports during the month: From Malay States & Labuan	Imports January to May 1938: Foreign	Imports January to May 1938: From Malay States & Labuan	Exports including re-exports during the month: Foreign	Exports including re-exports during the month: Local	Exports including re-exports January to May 1938: Foreign	Exports including re-exports January to May 1938: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over	Consumption 3: during the month	Consumption 3: Jan. to May 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,034	14,092	10,973	57,981	3,078	25,783	Nil	Nil	Nil	Nil	10,460	3,026	65,225	17,937	...	8,912	14,762	17	75
Johore ...	...	3,615	5,858	5,213	26,835	2,452	14,854	Nil	10	Nil	105	2,941	4,360	16,366	25,215	...	3,683	6,164	...	...
Kedah ...	...	345	3,632	2,757	14,565	787	4,422	Nil	Nil	Nil	Nil	1,603	1,658	9,646	9,210	...	323	3,937	...	...
Perlis ...	...	23	23	14	71	26	114	Nil	Nil	Nil	Nil	Nil	35	Nil	159	...	19	32	...	...
Kelantan ...	...	672	335	383	1,798	575	2,874	Nil	Nil	Nil	Nil	332	642	1,366	3,401	...	606	385	...	...
Trengganu ...	...	55	50	295	1,409	148	705	Nil	Nil	Nil	Nil	Nil	443	Nil	2,114	...	55	50	...	...
Brunei ...	...	6	55	45	226	59	318	...	...	...	...	...	91	...	545	...	15	59	...	...
Total Malay States	...	13,750	24,045	19,680	102,885	7,125	49,070	Nil	10	Nil	105	15,336	10,255	92,603	58,581	...	13,613	25,389	17	75
S. SETTLEMENTS :—																				
Malacca ...	...	2,498	1,434	1,114	5,894	543	2,636	Nil		Nil		2,073		12,453		...	2,326	1,513	...	...
Province Wellesley	...	2,287	657	459	2,186	280	1,112	Nil		Nil		6,998		39,328		...	1,578	704	...	...
Penang ...	2,405	4,953	12	14	93	79	429	2,129	10,627	10,927	63,458		Nil		Nil	2,676	5,148	13	...	...
Singapore ...	4,798	28,472	282	137	791	41	294	8,155		53,081		14,738		93,807		3,733	29,053	241	24	124
Labuan ...	...	43	Nil	Nil	Nil	9	59	41		240		Nil		Nil		...	49	Nil	...	...
Total Straits Settlements ...	7,203	38,253	2,385	1,724	8,964	952	4,530	10,325	10,627	64,248	63,458	22,909	Nil	145,583	Nil	6,409	38,154	2,471	24	124
Total Malaya ...	7,203	52,003	25,430	21,404	111,849	8,077	53,600	10,325	10,637	64,248	63,563	38,245	10,255	238,191	58,581	6,409	51,767	27,860	41	199

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	7,859	27,819	4,997	2,644	3,041	180
WET RUBBER	1,053	1,234	151	324	642	143
TOTAL ...	8,912	29,053	5,148	2,968	3,683	323

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. to May 1938 31
Singapore ...	24,270	157,008
Penang ...	9,362	57,434
Port Swettenham.	4,363	22,715
Malacca ...	250	1,034
MALAYA ...	38,245	238,191

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. to May 1938 34
Malay States ...	25,565	150,830
Straits Settlements	2,434	12,931
MALAYA ...	27,997	163,761

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) − (2) − (3) − (4) − (5) − (9) − (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 22nd June, 1938

METEOROLOGICAL SUMMARY, MALAYA, MAY, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	90.3	73.3	81.8	94	71	80	76	84.7	85.5	5.32	135.1	1.03	18	11	6	1	1	166.35	5.37	44
Bukit Jeram, Selangor ...	89.0	73.3	81.1	91	70	78	76	85.1	86.7	1.90	48.3	0.58	10	10			2	209.10	6.75	55
Sitiawan, Perak ...	90.3	74.0	82.1	94	72	87	76	85.3	85.7	7.62	193.5	2.67	15	11	3			202.05	6.52	53
Ipoh Aerodrome, Perak ...	91.0	73.9	82.5	96	71	88	76	84.7	85.1	6.57	166.9	1.55	17	14	8			206.90	6.67	55
Temerloh, Pahang ...	90.3	73.6	81.9	94	71	86	76	87.2	87.4	6.64	168.7	1.04	17	13	5	2		170.25	5.49	45
Kuala Lipis, Pahang ...	90.4	72.5	81.5	94	70	85	74	85.3	85.8	4.17	105.9	1.23	17	13	5	14		180.95	5.84	47
Kuala Pahang, Pahang ...	87.5	74.7	81.1	90	71	82	78	86.0	87.6	6.86	174.2	2.11	19	14	6			221.95	7.16	58
Kallang Aerodrome, S'pore ...	86.7	75.6	81.1	90	73	82	79	83.1	83.8	9.61	244.1	1.78	19	16	9		4	178.05	5.74	47
Bayan Lepas Aerodrome Penang ...	88.2	75.2	81.7	92	73	82	78	84.9	85.3	10.41	264.4	3.03	18	16	6		1	221.40	7.14	58
Bukit China, Malacca ...	86.4	74.4	80.4	90	71	83	77	84.6	85.3	3.39	86.1	0.81	13	9	6		4	199.95	6.45	53
Kluang, Johore ...	89.4	72.4	80.9	93	70	78	75	83.0	83.4	14.90	378.5	2.74	21	15	7	5	1	167.70	5.41	44
Bukit Lalang, Mersing, Johore	87.8	72.9	80.3	92	70	78	75	83.7	83.1	7.04	178.8	1.05	18	16	2		1	205.30	6.62	54
Alor Star, Kedah ...	88.6	74.9	81.7	92	72	82	78	85.7	86.5	6.28	159.5	1.30	17	14	1			208.80	6.67	54
Kota Bahru, Kelantan ...	89.9	74.5	82.2	93	73	85	77	85.5	85.6	6.13	155.7	1.60	15	11	2			218.30	7.04	51
Kuala Trengganu, Trengganu	89.6	73.6	81.6	93	71	83	76	86.1	86.5	4.61	117.1	2.26	13	10	5			238.75	7.70	63
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.7	63.7	69.2	78	61	70	65	72.6	72.9	11.51	292.4	1.26	23	22	9	9	3	144.05	4.65	38
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.9	58.6	66.2	77	54	71	63	71.1	70.9	6.59	167.4	1.82	24	20	4	1		127.00	4.10	33
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.6	60.7	67.1	77	58	69	63			6.45	163.8	2.02	23	20				138.40	4.46	36

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

AUGUST, 1938

EDITORIAL.

Malayan Pineapples. The Report on Pineapples, prepared by Mr. F. Birkinshaw for the International Horticultural Congress at Berlin, and which we reproduce in this number, is a concise statement of the present position of this important industry. The author reviews the history of the pineapple trade and the present condition of the industry in the more important countries of production, thus placing the reader in possession of the salient problems of canned pineapple production and marketing, and the manner in which such problems have been solved.

It is evident that the producers in Hawai and Japan—the two main sources of production outside Malaya—have achieved a state of organization and control which has firmly established the industry in these countries. It is to be regretted that the Malaya trade has been slow to initiate similar action to overcome the disabilities which for some time past have prejudiced her trade.

It is true that the Malayan pineapple trade has co-operated with the local Governments to ensure that the fruit shall be packed under hygienic conditions, and that a graded product shall be marketed. It has, however, been recognised for some time that these schemes, though good in themselves, are not sufficiently far-reaching, and that the marketing difficulties—which recently have become acute—will frequently recur unless there is some reconstruction of the organization of the trade.

We understand that this aspect of the problem is now freely recognised both by factory owners and exporters, and that negotiations are proceeding to organize a selling agency which should prove an adequate protection of the industry, and stabilize the selling price at an attractive figure for the purchaser, while maintaining a fair profit to the producer and canner.

Poultry in Malaya. There has been a very evident increase of interest in poultry-keeping in Malaya during the past two or three years, due in no small measure, we venture to suggest, to the results of investigations at the School of Agriculture and demonstrations at Agricultural Stations in various parts of the country as well as to the influence of departmental publications in English, Malay, Chinese and Tamil.

It is significant that whereas earlier introductions were chiefly made by private poultry fanciers, the interests of present-day breeders is more largely centred in the production of utility breeds, and it is probable that progress in the improvement of poultry in Malaya will advance more steadily for this reason.

Investigations at the School of Agriculture have added considerable knowledge to various aspects of the subject, in particular housing, rearing and feeding, and in the present number of this journal will be found a further thoughtful contribution on the prices and values of poultry foods in Malaya by Mr. G. E. Mann.

Given a sound knowledge of the principles of animal nutrition it is a comparatively simple matter to devise rations suitable for poultry in all stages of their development, but the selection of the cheapest ingredients to provide a balanced ration is of first importance if the venture is to prove profitable. Mr. Mann shews which of the foods easily procurable in Malaya may be most profitably employed in this connexion and the article should therefore serve as a useful guide to poultry-keepers.

The reader will recognise that the recommendations given are based on prices current at the time of writing the article. Prices vary according to supply and demand and the choice of ingredients at an economic price may therefore also vary. The publicity given to prices and food value of feeding stuffs may in itself influence market prices. Our readers are invited, therefore, to treat this article as a guide rather than a statement of hard and fast recommendations.

Original Articles.

POULTRY FOODS IN MALAYA: PRICES AND VALUES

BY

G. E. MANN,

Principal, School of Agriculture, Malaya.

There is everywhere a general tendency to regard individual foodstuffs as cheap or expensive according to their price and without making any detailed enquiry into their intrinsic value as food. Haphazard opinions may or may not be fairly accurate and opinions based on actual food values are obviously to be preferred. Animal nutrition is so complex that values can seldom be determined with complete accuracy but, fortunately, no great degree of accuracy is essential so long as one is not too dogmatic or hasty in drawing conclusions.

Proteins and Energy.

From the nutrition point of view, the intrinsic value of a given foodstuff depends on what it supplies in proteins, minerals, vitamins and energy; while palatability and freedom from substances which may adversely affect the health of an animal or the quality of its produce must also be taken into account. Considered quantitively, the two most important ingredients are:—

(*a*) proteins—which are required for the renewal of tissues destroyed by the wear and tear of life, for building up new tissues associated with growth, and for the creation of produce such as milk and eggs;

(*b*) energy-producing substances such as carbohydrates and fats—which maintain the body temperature and provide energy for movement.

Not all the proteins and energy so supplied are actually utilized by an animal; a portion, however small, is rejected in the faeces. There are ways, however, of ascertaining with fair accuracy what proportions of protein and energy can be assimilated and the results of such investigations have been recorded, each type of farm animal having its own tables of digestible nutrients. Those employed herein refer only to poultry. Energy may be expressed either as calories (indicating the amount of heat which the material can liberate) or as starch-equivalent (indicating the fat-producing power of the material in comparison with that of an equal weight of pure starch). The latter method is closely related to the former and is adopted in this article, which is inspired by a similar study by E. T. Halnan in England (1).

Basic Values.

Judging from recent statistics, the energy-producing foodstuff which commands the steadiest price in this country is the cereal padi (unhusked rice) the average price of which at the the mills in Krian is about $2.00 per pikul (=150 cents per 100 lbs.). As a correspondingly steady source of proteins, the author has chosen groundnut cake the average price of which (ex mill in Singapore) is about $3.12

per pikul (=234 cents per 100 lbs.). From these prices and from a knowledge of the average proportions of digestible protein (D.P.) and starch-equivalent (S.E.) which these two foods supply, the price per unit weight of proteins and energy can readily be calculated.

Thus, let 1 lb. of digestible protein cost x cents
and let 1 lb. of starch-equivalent cost y cents.

Then 100 lbs. whole padi, costing 150 cents and supplying on average 6.7 lbs. D.P. and 68 lbs. S.E., cost $(6.7x + 68y)$ cents;

and 100 lbs. groundnut cake, costing 234 cents and supplying on average 38.3 lbs. D.P. and 77 lbs. S.E., cost $(38.3x + 77y)$ cents.

Therefore $6.7x + 68y = 150$
and $38.3x + 77y = 234$
whence $x = 2.1$ and $y = 2.0$

In other words, basing one's judgment on the relatively steady prices and analyses of whole padi and groundnut cake, average prices at the mills are 2.1 cents per lb. for digestible protein and 2.0 cents per lb. for starch-equivalent.*

These unit *prices* may now, for purposes of comparison, be regarded as unit *values* so long as due allowance is made for (a) quality and (b) source of supply.

Quality.

By "quality" is meant in this place not so much freshness and cleanliness as the existence of any special nutritional virtue or objection which a foodstuff may possess. For example, the proteins of milk are of far greater biological value than those of maize. Again, yellow maize is in most circumstances superior to white maize because the former supplies appreciable quantities of the health-promoting vitamin A. White cargo bran and polishings are similarly preferable to the par-boiled varieties in that the latter have lost most if not all of their vitamin B in the process of maunfacture. Such advantages and disadvantages must obviously be taken into account when comparing prices although it is seldom possible to value them definitely in terms of money.

Source of Supply.

It has already been stated that the prices of padi and groundnut cake employed in this article are prices at the mills (in Krian and Singapore respectively). Purchasers elsewhere have to pay freight if they obtain their supplies direct from the mills. If, however, it suits their purpose better to buy from a local merchant (as is usually the case when only small quantities are required) the merchant has already paid freight and is entitled to recover it from the buyer. The merchant is also entitled to make a profit on the transaction for he has to provide labour and storage and he runs the risk of loss through depreciation. For poultry foodstuffs in Malaya, a fair average allowance for freight would appear to be about 25 cents per 100 lbs. What constitutes a fair middleman's profit is a more difficult question but 25 per cent of the cost price, excluding freight, is probably reasonable.

* Corresponding prices in England based on wheat and fish meal, are about 8.5 cents per lb. for digestible protein and 4.5 cents per lb. for starch-equivalent.

A further allowance for freight ought possibly to be made in the case of foodstuffs such as wheat and fish meal which are imported from overseas. No attempt, however, is made to allow for this in the present article. It is assumed for the purposes of this article that it is desirable to encourage the production of as much food as economically possible within the boundaries of this country; and this means that local stock must be fed on locally grown or produced materials of the cheapest nature consonent with efficiency.

Comparative Values of Poultry Foods.

Based on the above considerations, the accompanying table has been constructed to effect a comparison between average prices and values of a number of materials which are or could be employed as poultry foods in Malaya. Allowance has been made for local freight and middlemen's profits wherever the prices quoted are those of merchants, not producers. The most important column for study is column 6 which indicates as a percentage the relationship between prices and values. Figures around 100 indicate that the foodstuff is fairly priced; figures below 100 indicate that it is cheap; figures well above 100 indicate that the foodstuff is expensive when considered solely as a source of proteins and energy.

Discussion.

The basic values employed herein are derived from the prices of locally produced padi and groundnut cake, which have been selected because they are two of the commonest sources of proteins and energy respectively in this country and because their price and composition are reasonably steady.

Among other poultry foods in Malaya, cereals and their by-products may be considered first. It is not surprising to find that the price of wheat and oats is considerably in excess of their intrinsic value as they are imported from abroad and are intended for horses rather than poultry. Oats are claimed to have a special value for horses although it is not known wherein this virtue lies; but this does not apply to poultry and neither wheat nor oats can therefore be recommended for fowls in this country as they are uneconomic. Maize also is mainly an imported foodstuff; its price exceeds its calculated value by some 50 per cent. which cannot be justified by the fact that yellow varieties are a moderately good source of vitamin A. The quality of imported maize is often poor and there would appear to be plenty of scope for extending the production of this very useful foodstuff in Malaya, provided that sales could be effected at about two-thirds of the present price. Broken rice is employed fairly extensively as a poultry food; it sells at slightly more than its calculated value but allowance may be made for the fact that its use obviates to some extent the necessity of crushing or grinding whole padi. It is of particular use in the feeding of young chicks for which whole padi is unsuitable as it is liable to cause digestive disorders. Both polished and parboiled rice appear to be expensive, but it should be remembered that they are essentially articles of human diet and that their price is dependent on that of imported rice. They are seldom purchased as poultry food but, in most households, a certain amount of

cooked rice is usually left over after a meal and is often fed to chickens. Rice bran shews a surprising difference between present price and value, even when allowance is made for the fact that the white cargo variety is an important source of vitamin B_1, a deficiency of which leads to nervous disorders, paralysis and ultimately death. Until about two years ago, white cargo bran ex mill cost only 75 cents a bag instead of $1.25 as at present and at the former price was quite reasonable. Parboiled bran rightly commands a lower price in that its vitamin B content is negligible. White rice polishings, another valuable source of vitamin B_1, might well merit a somewhat higher price than at present if only it were more coarsely ground; most samples are so floury that it is difficult if not impossible to use them in any appreciable proportion without spoiling the texture and hence the palatability of poultry mashes.

Turning to cakes and meals, groundnut cake is not only one of the cheapest but is one of the best protein concentrates available in Malaya and its use as a poultry food might well be considerably extended. It is a constituent of all rations recommended by the School of Agriculture for fowls kept in pens and its use in even larger proportions than that adopted at present may be economically advisable. Definite recommendations on this point, however, must wait until controlled feeding trials have been carried out locally to ascertain how far the proteins of groundnut cake must be balanced by proteins of animal origin rather than by mineral substances, for investigations in England and America have led so far to very conflicting results. The use of gingelly and soya bean cakes for poultry cannot be recommended while prices remain at their present levels. The latter is similar to groundnut cake in composition while the former possibly owes its high price to the fact that it is very popular among the Indian cattle-owners in this country. Copra cake, however, sells at somewhat less than its calculated value and more use could probably be made of this material, especially in rations for growing stock and table birds where the proportion of proteins does not need to be so high as in the case of young chicks and laying hens.

Fish meal and whale meat meal, both of which are imported, are expensive. As indicated above, their proteins are possibly of better biological value than those of groundnut cake and fish meal of good quality finds extensive use in poultry foods in temperate countries. In spite of its animal proteins, however, whale meat meal has given very unsatisfactory results with young chicks (2). There would appear to be at least a *prima facie* case for the manufacture of fish and meat meals in Malaya. The author understands that serious obstacles exist at present which would probably prevent the local production of fish meal on any considerable scale, while practical investigations by an ex-student of the School indicate that small-scale efforts could probably not compete with imported material. The possibilities of a local meat meal industry, however, would appear to be more promising, particularly in a densely populated locality like Singapore.

Dried skim milk and unextracted yeast both command large and at first sight exorbitant prices, even when allowance is made for the fact that they have to be imported; but the special virtues of these two foodstuffs, which are closely inter-

Poultry Foodstuffs in Malaya; Comparative Prices and Values.

	Item.	(1) D.P. (per cent.)	(2) S.E. (per cent.)	(3) Average Price	(4) Calculated Price per 100 lbs., less freight and middlemen's profit.	(5) Calculated Value per 100 lbs.	(6) Ratio of Price to Value (per cent.)	(7) Remarks re Column (3)
Cereals and By-Products	Rice, unhusked (padi) ...	6.7	68	$2.00 per pikul	150 cents	150 cents	100	At Mill, Krian
	„ broken ...	6.4	87	$4.90 „ 170 kati	216 „	187 „	116	Ex „ „
	„ polished ...	7.0	87	$6.60 „ 170 kati	292 „	189 „	154	„ „ „
	„ parboiled ...	5.0	87	$6.55 „ 170 kati	289 „	184 „	157	„ „ „
	Maize ...	7.0	75	$4.50 „ pikul	250 „	165 „	152	„ Merchants, K.L.
	Oats ...	6.7	58	$5.00 „ 100 lbs.	380 „	130 „	292	„ „ S'pore
	Wheat ...	11.7	77	$8.00 „ pikul	460 „	179 „	257	„ „ K.L.
	Barn, rice, white cargo ...	4.4	29	$1.25 „ 75 kati	123 „	67 „	185	„ Mill, Krian
	„ „ parboiled ...	5.3	32	$1.05 „ 75 kati	106 „	75 „	141	„ „ „
	Polishings, rice, white cargo	9.2	81	$2.35 „ 100 kati	176 „	181 „	97	„ „ „
	„ „ parboiled ...	11.9	88	$2.35 „ 100 kati	176 „	201 „	88	„ „ „
Cakes and Meals	Cake, copra, pressed twice ...	13.2	76	$2.00 „ pikul	150 „	180 „	83	„ „ K. Selangor
	„ gingelly ...	23.7	67	$5.25 „ pikul	295 „	184 „	160	„ Merchants, K.L.
	„ groundnut ...	38.3	77	$3.12 „ pikul	234 „	234 „	100	„ Mill, S'pore
	„ soya bean ...	34.0	62	$5.50 „ pikul	291 „	195 „	149	„ Merchants, S'pore
	Meal, fish ...	50.0	57	$9.00 „ pikul	700 „	219 „	320	„ „ S'pore
	„ whale meat ...	43.0	61	$10.00 „ cwt.	694 „	212 „	327	„ „ K.L.
Misc.	Milk, dried skim ...	29.5	75	$22.00 „ cwt.	1551 „	212 „	731	„ „
	Yeast, dried unextracted ...	43.7	76	$25.00 „ cwt.	1766 „	244 „	724	„ „
	Gram, green (kachang ijau) ...	18.2	67	$6.00 „ pikul	340 „	172 „	198	„ „

1 kati = $1\frac{1}{3}$ lbs. 1 picul = $133\frac{1}{3}$ lbs.

related, must be taken into consideration. Milk is one of the very few foods in the world in which the proteins can be regarded as first-class; its inclusion in rations for baby chicks has a spectacular influence on growth-rate (2) and, in spite of the expense, is justified in the case of good young stock. High levels of protein in the diet of young animals require, however, to be balanced by correspondingly high levels of the growth-promoting vitamin B_2 which cannot apparently be secured by the use of bran or polishings. For this reason, a small proportion of dried unextracted yeast is almost invariably included in good chick mashes. There would appear to be no cheap but efficient substitute for these two materials in Malaya, apart from a return to the natural diet which is available under free-range conditions where the risk of disease more than counterbalances the cost of milk and yeast for young chicks of good pedigree.

Finally, the price of green gram—another imported foodstuff—is again too high for the majority of local poultry farmers. It is, in fact, regarded by Malays as a luxury in their own diet and, in spite of its general suitability for inclusion in poultry mashes, it is unlikely to find general favour at its present price.

Summary.

A method of calculating the value of digestible protein and starch-equivalent in poultry foods is described.

Digestible protein is shewn to be worth about 2.1 cents per lb. and starch-equivalent 2.0 cents per lb. Corresponding values in England are about 8.5 and 4.5 cents per lb. respectively.

Average prices and calculated values are tabulated for a number of materials which are or could be fed to poultry in Malaya.

Comparisons drawn between these prices and values lead to the following conclusions:—

(i) the use of imported cereals is uneconomic;

(ii) local extension of the cultivation of yellow maize and the manufacture of meat meal would probably be justified;

(iii) the use in poultry rations of copra cake and particularly of groundnut cake should be extended in order to lower feeding costs; but feeding trials are first required to indicate to what extent a reduction can be made in the use of animal proteins.

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PINEAPPLES.

Report by F. Birkinshaw, Chief Field Officer, for the International Horticultural Congress, Berlin, August 12th to 20th, 1938.

Introduction.

It is generally accepted that the many varieties of the pineapple cultivated for sale either as a fresh fruit or as a canned product owe their origin to the one species, *Ananas sativus* (Lindl.) a native of tropical America.

In common with many cultivated tropical plants, the pineapple exhibits much variation, even though in cultivation the normal method of propagation by slips or suckers is a-sexual. Some of the better forms of the cultivated pineapple produce very few seeds indeed. No variety would appear to have developed seedlessness to quite the same extent as have many cultivated forms of the banana, but it is estimated that in Hawaii less than one fruit in a thousand of Smooth Cayenne bears seeds naturally.

Many of the present cultivated varieties would appear either to have arisen, or have been segregated, during the eighteenth and nineteenth centuries, a period when pineapple growing under glass was fashionable in the gardens of wealthy landowners in Europe, notably in France and England. Both at that time and since, various enthusiasts have attempted a classification of the varieties of the pineapple. One of the first lists was prepared by Munro for the London Horticultural Society in 1835, whilst more recent ones are those of Moise S. Bertoni (1919) and W. A. Wendt (1925). Those interested in this particular branch of the subject should consult either the original publications concerned or the lists reproduced as an appendix in "The Pineapple" a book written by Maxwell O. Johnson and published in Hawaii in 1935.

Climate, Soil and Cultivation.

In considering the requirements of the pineapple in respect of climate and soil it is desirable not altogether to disregard the environment of the species in its native habitat. I have been unable to find any detailed description of the conditions under which *Ananas sativus* grows in nature, but it seems reasonable to assume (as its native habitat is tropical America and the plant belongs to the Natural Order of Bromeliaceae) that it grows in a warm humid atmosphere, is subjected to a heavy rainfall, has decaying vegetation for its rooting medium and grows under high trees which shade the plant from the hot rays of a tropical sun.

The conditions under which the pineapple is cultivated vary considerably in respect of both soil and climate. Soils range from the fairly rich volcanic soil of Hawaii, through the comparatively poor quartzite soils of Malaya to the still less fertile sandy soils of Florida. On the other hand, the pineapple also flourishes in deep peat on the coastal plain of Selangor, Malaya, where more than 8,000 acres are now planted. The variations in climate are not quite so great, the extremes probably being best exemplified by the humid tropical climate of Malaya with an

annual rainfall of about 90 inches and a mean shade temperature of 80°F. and by the climate of Port Elizabeth, South Africa, with an annual rainfall of little more than 22 inches and a mean shade temperature of less than 65°F. The annual rainfall of Hawaii approximates to 30 inches and the mean shade temperature is slightly below 75°F.

In Hawaii, normal cultivation practice is to give the soil considerable tractor ploughing and tillage before planting; to plant at the rate of from 11,000 to 18,000 plants to the acre; to manure the crop heavily with artificial fertilizers; whilst paper-mulching is now a standardized practice which appears to be especially beneficial in areas of low rainfall. Normally it would seem that one plant crop and two ratoon crops are harvested before the plants are uprooted preparatory to replanting. Under these conditions yields of 40 tons of fruit from the plant crop, 30 tons from the first ratoon and 20 tons from the second ratoon crop are not unusual in the areas where the soil is best suited for pineapple cultivation.

Fairly heavy manuring with artificials is also practised in Florida, Porto Rico and Queensland, but has not been the general practice in Malaya or in other parts of the equatorial tropics. In so far as I have been able to ascertain, in no other country have yields of fruit been so high as those given above for Hawaii. A general average for elsewhere appears to be about 10 tons an acre per annum for Smooth Cayenne and less for the Queen pine.

In Malaya, pineapples have been grown almost exclusively in the past as a catch crop between young rubber and only very recently has an attempt been made to establish them as a permanent sole crop, young rubber plantations being no longer available for the continuance of the former practice. Experiments designed to determine the best methods to employ under the new circumstances have given some guidance, but have also served to emphasise fresh aspects of the problem needing elucidation. Adequate control of erosion and the maintenance of soil fertility in a tropical climate with a high rainfall, though of prime importance, is only one aspect of the problem. There are indications that climatic and other factors may make it impracticable to adopt the close planting of Hawaii and this obviously has a direct bearing on the economics of manuring, for one fruit is the maximum that can be produced by a plant at the first crop. Experiments on these aspects of the problem are being conducted at the Pineapple Stations both in Singapore and Johore.

Cultivated Varieties, Selection and Breeding.

Two varieties supply the majority of the pineapples used for canning, namely, the Smooth Cayenne (or Kew pine) grown in Hawaii and Queensland and the Queen pine grown in Malaya and South Africa.

Another variety, the Red Spanish, is the one most commonly grown in Florida, Cuba and Porto Rico, whilst it is stated that in Formosa in 1936 some 4,000 acres were under foreign varieties and 18,000 acres under indigenous varieties. I can only assume that this latter term must refer to varieties that have been long established in Formosa, as opposed to varieties recently imported.

The fruit used for canning in Malaya is known locally as Singapore Canning. Both in Hawaii and Malaya there is considerable variation in size, colour, texture and flavour of the fruit, and in both countries the selection of desirable types for canning is in progress.

One problem connected with this work is to propagate the selected plants sufficiently quickly to supply enough planting material within a reasonable time for use on a commercial scale The method of propagating from half inch thick transverse sections of the plant stem first practised in St. Lucia, British West Indies, will, therefore, prove of considerable practical value for propagating such selected plants as are found to be amenable to this treatment.

In Hawaii, the marking in the field of undesirable types with the object that they should not be used for propagation appears to be a present normal practice.

The raising of pineapples from seed was practised by gardeners in Europe from 1765 onwards and more recently seedlings have been raised in Florida, Hawaii, Malaya and elsewhere. Such seedlings show remarkable variation, contain a large proportion of freaks and little success would appear to have attended the efforts made to obtain superior varieties from seed collected indiscriminately.

In recent years controlled hybridization between one variety and another and between varieties and species, has been done in Hawaii and on a smaller scale in Malaya. The work in Malaya is as yet too recent to have provided results, but reports from Hawaii indicate that some crosses between Smooth Cayenne and the Queen varieties have produced fruits of a high standard of quality.

Pests and Diseases.

Many and various pests and diseases have been described from time to time as having damaged either the fruit or plant of the pineapple. A summary of such is given in "The Pineapple" by Johnson, mentioned earlier.

Fruit rots, caused by both insects and fungi, occur in both Hawaii and Malaya, but nowhere does the damage to fruits in the field appear to be sufficiently serious to warrant more than the briefest mention here. In countries where pineapples are grown for export as fresh fruits, the matter is obviously of greater importance.

In most countries where pineapples are grown extensively, trouble has been experienced from what is commonly known as "wilt" which is a convenient term for describing an unhealthy appearance of the plant, though the real causes of the trouble are various. The plants cease growth and the leaves turn red, lose their rigidity and wither from the tips downwards. It is common for large areas to exhibit this appearance and the real causative agent has often been difficult to determine and, in some cases, is still undetermined.

A form of wilt present in Malaya is under investigation, the real cause of which is still not established.

Nematode worms have been the cause of a form of wilt to pineapples in Hawaii and elsewhere. Control consists of thorough tillage of land before planting, the growing of plants not subject to nematode attack as a rotation and, in some instances, long following has been practised.

A remarkable practice in connexion with pineapple cultivation in Hawaii is that of periodic spraying with a solution of iron sulphate to prevent chlorosis. The yellowing of the leaves of pineapples in Hawaii was at first thought to be due to manganese poisoning. Investigation showed, however, that the phenomenon, although associated with the presence of unusually large amounts of manganese in the soil, was really caused by a deficiency of iron in the plants. Spraying with a solution of iron sulphate appears now to be universally practised in Hawaii, the strength of the solution used varying from 8 to as high as 30 pounds to 50 gallons of water and spraying in the young stages of growth may be as frequent as twice a month.

Recent Developments with Special References to the Production of Canned Pineapples.

The pineapple is grown throughout the tropics for local consumption as a fresh fruit but the Canary Islanders were probably the first to make extensive shipments of the fruit. At the present time the fruit is exported from Florida and Porto Rico for the American fresh fruit markets; both South Africa and the Azores make shipments to England; Queensland supplies fruits for other parts of Australia; and Hawaii ships a comparatively small number in cold storage to the Pacific coast of America. Whilst considerable improvements in methods of growing, harvesting, grading, handling and the technique of packing and shipment have resulted in the markets concerned being supplied with a much more reliable and higher quality product than formerly, from the nature of things the fresh fruit trade can never develop to anything like the dimensions the trade in canned pineapples has reached.

The chief countries concerned in pineapple canning, in order of present importance, are:— Hawaii, Malaya, Formosa, Australia and South Africa.

The following figures regarding each of these countries in the order mentioned will serve to indicate where development has taken place during the past five years from 1932 to 1936 inclusive, round numbers being used for convenience.

Hawaiian producion was five million cases in 1932 and was estimated to be twelve million cases in 1936. The figures for each year are:— 1932, five million; 1933, eight million; 1934, nine million; 1935, ten million; 1936, twelve million cases. The figures for the last three years are approximate estimates and are not taken from corrected returns.

Malayan exports were 66,000 tons in 1932 and 76,000 tons in 1936. The figures for each year are:—1932, 66,000; 1933, 60,000; 1934, 66,000; 1935, 74,000; 1936, 76,000 tons. This is equivalent to about 2,400,000 cases of 48 1½ lb. cans.

Formosa produced 560,000 cases in 1932 and the estimate for 1936 was one million cases, the 1935 figure being a little short of 1,200,000 cases.

Australia exported 1,500 tons in 1932 and only 782 tons in 1936. The low figure for 1936 is a sudden drop for which I have no explanation, the figures for each year being:— 1932, 1,500; 1933, 1,300; 1934, 2,000; 1935, 1,700; 1936, 782 tons.

The only figures I have been able to obtain for South Africa are for exports to the United Kingdom, which were 200 tons in 1932 and 166 tons in 1936.

The figures given indicate that, in respect of exports, Hawaii, Malaya and Formosa are the most important countries concerned. A brief account of the development and present position in each of these countries will, therefore, form a fitting conclusion to this report and for reasons that will appear, I will treat first of Hawaii, then of Formosa and lastly of Malaya.

Hawaii.—Pineapple planting in Honolulu was mentioned as early as 1809. Smooth Cayenne appears to have been introduced by 1890, but a large scale introduction of this variety from Queensland in 1896 would appear to have furnished the stock from which most of the Hawaiian plants are derived. The variety, Smooth Cayenne, appears to be eminently suitable for Hawaiian requirements. Most of the present output of twelve million cases is consumed in the United States and it has been estimated that less than twenty per cent. of the total production is exported, Hawaii being treated as part of the United States of America for this purpose. Actually the exports of canned pineapples from the United States of America for the fiscal year 1935 to 1936 totalled 526.6 thousand cases, which is very much less than twenty per cent. of the total Hawaiian pack. The Hawaiian Islands contain approximately 90,000 acres suitable for pineapple cultivation, but only the most fertile portion or approximately 45,000 acres is at present used for the crop.

Efficiency appears to be maintained in everything connected with the industry; the factory construction, machinery and management are of a high standard and grading standards are well maintained. Marketing of the product receives the same close attention. With a few minor exceptions the canning companies of Hawaii are members of the Pineapple Producers' Co-operative Association, which was founded in 1932 and in 1935, a fifteen year marketing agreement was reached by the members. At the commencement of each season an estimate is made of the sales requirements for the coming year and each company is allocated its production quota.

Formosa.—The area under pineapple cultivation in Formosa has shown a steady and fairly regular increase from 5,237 acres in 1925 to an estimated acreage of 18,000 in 1936, the official return for 1935 being 16,800 acres.

The production figures show a corresponding increase, although the estimated production of one million cases (each of 36 cans) for 1936 is 16 per cent. below the figure of 1,189,000 cases returned for 1935. Most of the Formosan pack is consumed in Japan, but exports to other countries jumped in 1932 to nearly 30,000 cases as compared with only 3,000 cases in 1931 and has further increased since to 107,500 cases in 1935 and an estimated figure of over 236,000 cases in 1936.

The fact that a reorganization of the industry in 1934 was instigated by the Government and that this has led to an amalgamation of practically the whole of the pineapple industry interests under two controlling bodies, indicates that the Formosan canned pineapple industry is likely to be an increasingly important competitor in world markets. The "Formosan Amalgamated Pineapple Com-

pany, Ltd." and the "Taiwan Development Company" have decided to co-operate, the former being concerned specially with canning and export and the latter with fruit production. The Development Company at present controls about 12,000 acres and intends gradually to bring a further 48,000 acres under pineapples.

Malaya.—The Malayan pineapple canning industry owes its origin to Chinese initiative and Chinese have remained almost wholly responsible for its maintenance and management, although European exporters and shippers have been concerned to some extent in financing the trade.

I have not succeeded in tracing the very commencement of the industry, but it is recorded that pineapples were canned in Singapore as early as 1895.

The variety, "Singapore Canning", appears to be more suited to the climate and needs of the Malayan industry than would Smooth Cayenne, the variety so well suited to Hawaii. In the tropical climate of Malaya the fruit of the latter normally grows to an enormous size, its flesh is inclined to be watery and it never develops the rich golden colour which is such a pleasing characteristic of the best types of Singapore Canning, when harvested at the proper stage of ripeness.

In the past, the Malayan industry has been enabled to maintain its competition in world markets on account of the comparative cheapness of its product, notwithstanding that quality was unreliable and varied.

It was recognized by the Department of Agriculture several years ago that the altered circumstances occasioned by the decline in the planting of rubber would require considerable reorganization of the industry in respect of cultivation methods, factory equipment and management and quality and grading of the product. Cultivation problems have been reviewed earlier in this report. The first important step taken with regard to factories was the passing of legislation in 1934 stipulating certain requirements in respect of factory construction and management and providing for their inspection and the registration only of such factories as conformed to the requirements laid down. This has resulted in a very marked improvement in factory construction, routine practice and general management. Since then, agreement has been reached with the trade on the matters of standardized can sizes and a scheme of grading and legislation to provide for their adoption has been drafted and submitted to the Governments concerned.

The area under pineapple for canning in Malaya has increased considerably of recent years and totalled nearly 70,000 acres in 1936. It is obvious that the increased crop can only be marketed satisfactorily if considerable attention is given to ensure that the quality of the product is maintained at a reliable standard and that any graded product marketed is kept well up to the standards required by regulations.

Summary.

Though *Ananas sativus* in its native habitat of tropical America probably grows under shade in a humid atmosphere and roots in decaying vegetable matter, its cultivated varieties are grown under a variety of conditions in respect of soil and climate.

The varieties most extensively grown for canning are Smooth Cayenne in Hawaii and Queensland and the Queen pine in Malaya and South Africa. Red Spanish is grown in Florida, Cuba and Porto Rico. Chance seedlings exhibit great

variation and contain a high proportion of freaks. Controlled hybridization in Hawaii appears to offer better prospects of obtaining new types of quality. Both Smooth Cayenne and the Queen pine show considerable variation in quality of fruit and selection of desirable types is practised in Hawaii and Malaya; also in Hawaii normal field practice includes precautions for limiting the propagation of undesirable types.

The most serious troubles affecting pineapples are various kinds of "wilt", the primary causes of which are various and sometimes obscure and difficult of determination.

Hawaii, Malaya and Formosa are at present the most important centres of canned pineapple production in respect of world trade and prospects of further development. The Hawaiian industry is characterized by exceptionally heavy yields per acre and by great efficiency in all details. Present annual production is about twelve million cases.

In Formosa production has steadily increased for several years and exports have jumped from 3,000 cases in 1931 to an estimate of 236,000 cases in 1936. The industry was recently reorganized at the instigation of Government and Formosan canned pines are likely to be an increasingly important competitor in world markets.

In Malaya, pineapples, which were formerly a catch crop under young rubber, are now grown as a sole crop. The new problems concomitant with this transition have been the subject of investigation by the Department of Agriculture for several years, in respect of cultivation practice, factory construction and management and grading and marketing of the product.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

2nd Quarter 1938.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

Rainfall in April was plentiful, in many districts much above the average for this month. In May precipitation was less plentiful and in most parts of the country drought conditions had already set in before the end of the month. June was exceptionally dry throughout the Peninsula, although in parts of Kedah there were violent storms and squalls during the last week.

Prices and Production.

Prices paid for small-holders' rubber are summarized in Tables I and II, which show the extremes and means of prices recorded at a number of centres in each State.

The price of rubber shewed a downward tendency during the first two months under review but recovered during June. In many instances the fluctuations were due to the price of coupons, as uncouponed rubber was fairly steady at low prices.

The following observations, contained in the Annual Report for 1937 of the State Agricultural Officer, Perak, epitomizes the position which obtains throughout the country in relation to the sale of rubber from small holdings:—

> "The practice of selling coupons separately has continued throughout the year and it is evident that they are now generally treated as a separate commodity. Prices vary slightly according to the price of couponed rubber but the greatest variation would appear to depend on the period during the quarter when offered for sale. At the commencement of the quarter there is a concerted movement to sell coupons resulting in a fall in value. Prices usually rise as the quarter advances but fall again towards the end of the quarter when dealers have obtained sufficient to cover their stocks. The usual price ranges between 25 per cent. and 33 per cent. of the couponed product."

Production of small-holding rubber for the quarter is shewn in Table III, which is prepared from the monthly reports of production, stocks, imports and exports of rubber, published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping.

With the exception of Pahang where the position was similar to that recorded for the first quarter, and Singapore where the area is negligible, there was a marked increase in the area of small holdings out of tapping. At the end of the quarter

Table I.

Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

2nd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				APRIL				
Smoked sheet	26.00-18.50	27.00-18.00	28.00-19.00	28.00-18.50	26.00-17.50	26.00-23.50	25.50-18.00	25.00-17.00
Unsmoked sheet	24.50-17.00	24.00-16.50	24.00-16.50	24.50-17.00	23.50-18.00	24.00-22.50	24.00-15.50	24.30-16.00
Scrap	18.00-11.00	18.00-17.00	19.00-14.50	—	—	19.00-18.00	19.00-12.00	20.00-14.00
				MAY				
Smoked sheet	23.00-19.00	26.50-19.00	26.00-19.00	24.00-20.50	24.00-17.00	23.00-21.50	24.50-20.50	24.50-19.00
Unsmoked sheet	24.00-18.00	23.50-17.00	22.00-17.00	22.00-17.00	22.50-16.50	21.50-19.50	22.00-19.00	23.00-17.00
Scrap	16.00-11.00	17.00-16.00	17.00-14.00	—	18.00-17.00	18.50-16.00	17.00-13.00	18.00-14.50
				JUNE				
Smoked sheet	27.00-21.00	27.00-18.00	27.80-21.00	28.00-20.00	28.00-17.00	27.50-23.00	28.50-21.00	27.00-20.00
Unsmoked sheet	28.00-20.00	25 40-17.00	26.30-19.00	25.00-19.00	23.60-18.50	25.50-21.00	26.00-18.00	26.50-18.00
Scrap	22.00-12.00	17.00-15.00	19.00-16.00	—	—	20.50-18.50	23.00-14.00	20.00-14.00

Table II.

Mean of Highest and Lowest Rubber Prices Paid by Local Dealers at a number of Centres in each State.
(In Straits dollars per picul (133 1/3 lbs.))

2nd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				APRIL				
Smoked sheet	24.83-20.50	23.96-19.91	25.33-22.23	25.71-20.54	23.60-20.20	25.33-23.66	25.15-20.75	23.78-19.99
Unsmoked sheet	23.87-18.25	22.14-17.92	22.93-20.21	23.30-17.60	22.20-19.62	23.50-22.50	23.15-18.37	22.71-18.34
Scrap	15 75-13 50	18.00-17.00	18.50-15 75	—	—	19.00-18.19	18.00-14.00	17.84-15.82
				MAY				
Smoked sheet	22.25-19.75	23.00-20.55	23.17-22.63	23.70-20.80	22.71-20.09	22.83-22.00	22.62-20.75	22.47-20.40
Unsmoked sheet	22.20-19.12	21.45-18.13	20.79-18.79	21.70-18.60	21.70-18.75	21.33-20.17	21.00-18.50	21.10-18.93
Scrap	15.25-13.00	17.00-16 00	16.50-14.50	—	18.00-14.30	18.00-16.83	16.00-14.00	17.20-15.69
				JUNE				
Smoked sheet	26.50-22.00	24.70-21.63	26.50-22.97	25.60-21.50	23.58-20.36	26.77-25.67	27.37-22.62	23.80-21.44
Unsmoked sheet	26.37-20.50	22.91-19.97	23.13-20.80	23.60-19.70	22.03-19.17	24.67-22.83	24.75-20.50	22.72-20.16
Scrap	18.37-14.00	17.00-15.00	18 50-16.50	—	—	19.77-18.67	20.62-16.00	18.56-16.62

Table III.

Production of Rubber on Small Holdings.

(in tons)

	Total First Half-Year 1937	1st Quarter 1938	2nd Quarter 1938	Total First Half-Year 1938
Federated Malay States ...	39,739	17,067	15,683	33,650
Unfederated Malay States ...	37,878	16,749	14,039	30,788
Straits Settlements ...	7,967	3,298	3,000	6,298
TOTAL MALAYA ...	85,584	38,014	32,722	70,736

under review, for the whole of the Peninsula 419,600 acres were untapped, or 33.2 per cent. of the tappable rubber, as compared with 335,100 acres or 26.9 per cent. at the end of the first quarter. Tables V and VI tabulate the results of the quarterly survey and provide a comparison with the previous quarter and last year.

The reduction of tapping is generally ascribed to the continued low price of the commodity, the reduced quota under rubber regulation, and in many districts to the counter attractions of a very heavy fruit crop and to padi planting.

Quoting again from the Perak report for 1937, the author's observations are generally applicable to the present position:—

> "The practice of selling coupons without rubber is directly responsible for the majority of the untapped holdings. In many, if not most instances, this rest is beneficial but it has the drawback of contributing to unemployment as in many cases income from employment as tappers largely contributes to the maintenance of the village Malay, who does not own his own rubber. The percentage of returns indicate that there is a tendency to increase tapping as prices rise although the decrease when prices fall is not always proportionate. This indicates that a large number of small-holders have of necessity to continue tapping so long as the product is saleable."

Financial arrangements between owners and tappers have been made in some areas. In Selangor it is reported that under the new conditions payment to tappers is usually 5 cents per kati of dry rubber, two-thirds share to tappers, or half share plus 15 kati coupons per acre tapped. Even so, it is added, returns to tappers are still very low, in some cases being as little as $3 per month.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of June, 1938.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	8,000	22
Kinta	38,874	5.400	14
Kuala Kangsar	92,166	43.300	47
Upper Perak	15,590	10.800	69
Larut & Selam	43,132	6 900	16
Krian	9.408	7,400	79
Lower Perak*	26,735	10,200	38
Dindings	9.873	7,900	80
	271.965	99,900	38

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	16,143	9.800	61
Kuala Langat	23,881	9,100	38
Ulu Langat	45,012	17,600	39
Ulu Selangor	31,463	10,100	32
Kuala Lumpur	20,277	10,300	51
Kuala Selangor†	8,417	3.500	42
	145,193	60,400	42

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	23,639	20,300	86
Tampin	21,896	16,400	75
Kuala Pilah	31,832	14,000	44
Jelebu	9,097	2,000	22
Port Dickson	11,133	8,600	77
	97,597	61,300	63

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	10,534	2,800	27
Kuala Lipis	15,457	2,000	13
Bentong	12,224	3.200	26
Other Districts†	40,373	9,700	21
	84,588	17,700	21

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	14,093	9,700	60
Alor Gajah	30,838	3,100	10
Jasin	25,286	6,800	27
	70,217	19,600	28

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,549	500	15
Central	10,785	3,600	33
South	8,936	6,900	77
Penang	15,822	1,700	11
	39,092	12,700	32

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	20,115	400	2
	20,115	400	2

JOHORE	350,007	91,000	26
KEDAH	102,126	29,600	29
PERLIS	2,916	27,000	33
KELANTAN & ‡	49,133		
TRENGGANU	29,836		

The percentage of areas out of tapping in March, 1938, was as follows:—Perak 25, Selangor 31, Negri Sembilan 58, Pahang 22, Malacca 22, Penang and Province Wellesley 28, Singapore 10, Johore 19, Kedah 28.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

‡ Estimated from percentage for rest of Malaya.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	June 1937		March 1938		June 1938	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S. ...	104,600	19.4	189,000	31.5	239,300	39.9
S.S. ...	13,200	10.7	28,900	23.1	32,700	25.3
U.M.S. ...	77,500	15.5	117,200	21.8	147,600	27.6
MALAYA ...	195,300	16.8	335,100	26.9	419,600	33.2

Quality of Rubber.

The two most important factors towards the improvement of the quality of rubber appear to be the continued and extended use of smoke cabinets and the exhibiting by dealers of grades of rubber with a public statement posted on their premises shewing the grades and current prices.

While in certain districts price discrimination between smoked and unsmoked is small and therefore unattractive to small producers, in many States the use of these cabinets is firmly established; it is reported in Pahang, for instance, that there are now 236 cabinets, most of which are in use. Further evidence of this growing interest amongst producers of quality of the produce is provided from north Perak where a number of Malays have combined to erect a smoke house 15 ft. high by 7 ft., with a capacity of 700-800 sheets of rubber. In all such efforts to improve the quality of rubber the small-holder is encouraged and helped by the Asiatic Rubber Instructors. Attention is invited to the remarks of the Director of the Rubber Research Institute at the recent meeting of the Agricultural Advisory Committee, a report of which will be found on another page of this issue of *The Malayan Agricultural Journal.*

Assistance in the campaign to encourage the production of a better grade of rubber has come from an unexpected quarter. The Temerloh, Pahang, rubber dealers have jointly issued a circular in English, Malay and Chinese on methods for the preparation of sheet rubber; and also announcing a cut of $6 per picul for rubber below grade standard.

General Conditions of Holdings.

Isolated instances of budding are reported, but it cannot be claimed that there is any general acceptance of this method of replanting.

Cultivation operations such as weeding are generally neglected, although Krian, Perak, reports that many holdings in that area have been dug or the undergrowth slashed. Holdings in this area in which this work is neglected are usually untapped

areas with damaged trees or holdings with absentee owners. In other areas of Perak several small holdings and larger areas have been cleaned of undergrowth and lalang grass, advantage being taken of the dry weather to effect this improvement.

In Pahang, where owing to the hilly nature of some of the rubber land soil erosion may be serious, good propaganda has been continually carried on. Soil erosion damage in Negri Sembilan is said to be less prevalent than formerly as the most usual practice is to allow natural vegetation to become established and to slash it periodically. Elsewhere soil erosion calls for no comment at present.

Diseases.

The position regarding diseases may be considered as satisfactory. Mouldy Rot (*Ceratostomella fimbriata*) was prevalent in most States during the wet weather in April, but the application of suitable fungicides held it in check, and the dry weather during the latter part of the quarter considerably assisted its control. The most serious outbreak appears to have been in North Johore; a considerable quantity of fungicide was sold at cost price by the Department.

Sporadic outbreaks of Pink Disease (*Corticium salmonicolor*) were reported from all States. Treatment was effectively carried out and the dry weather also helped to check the disease.

Oidium Heveae was widespread in south Perak but recovery was complete. A mild outbreak was reported from north and central Johore in April but there were no traces of the disease a month later. Sixteen cases were reported in Negri Sembilan.

Root diseases are fairly general, especially on the old holdings and few owners take any action to combat them.

Economic Position of Small-Holders.

The Malacca report and all reports from Johore make mention of the effect of the present market position on the economic life of small-holders. South Johore report states that small-holders are in a worse plight than they have been for some time and the lack of alternative employment has increased their difficulties. North Johore reports that the average small-holder is worse off than he has been for years. Rubber—in the majority of cases his one and only mainstay—has depreciated below a remunerative level, while the issue of export rights for the quarter was only 50 kati per equivalent acre, representing a decrease from the first quarter of 10 kati per unit area. "With such a decrease in the issue," the report continues, "any benefit likely to accrue from the slightly enhanced price of coupons is immediately counteracted."

Doubtless similar conditions apply elsewhere. The very favourable fruit season throughout the country has temporarily afforded a certain measure of relief to their fortunate possessors, while greater attention has been given to padi cultivation and the production of such products as copra and arecanuts. It must be realized, however, that outside certain extensive areas of padi and coconuts, rubber cultivation still dominates the economic position of the small-holder, and with the low price of rubber and curtailment of tapping, the large majority find themselves in very straightened circumstances.

Miscellaneous.

COCONUT OIL EXTRACTION.

In the enquiry columns of a contemporary trade journal a description was recently given of a method for extracting coconut oil from "Santan" or coconut milk:—

"A fully ripe nut is grated and the gata† obtained by squeezing the meat with the least amount of water possible diluted in the ratio of 1 part of pure gata to 3 parts of water. This is allowed to stand for 48 hours and organisms found in the scum of the fermenting milk are either used directly or better still propagated in sterile nutrient bouillon. The large-size bacillus, rod-shaped with rounded ends are the ones that give best results.

Ripe nuts are cracked, the meat grated as fine as possible, a small amount of water added and the whole squeezed to get the milk (gata). This gata is next diluted with water in the proportion of 1 part gata and 3 parts water. The diluted gata is then inoculated with the bacteria obtained as above. The container is next covered and allowed to stand. After 15-20 hours a water white oil separates on top and may be syphoned out. The scum layer (between the oil and water layers) may be heated and more oil, although slightly coloured, obtained. The water white oil is free from the usual nutty odor of coconut oil from copra. If only a small amount of oil from 1-3 nuts is desired the isolation of the organism may not be necessary. The gata properly diluted (1:3) is allowed to ferment observing carefully after 15 hours the formation of oil. It should not be allowed to stand more than 25 hours to avoid formation of strong odor in the oil."

This process has been examined, two nuts being used for each experiment, the contained "meats" being sliced on a steel plane, and subsequently grated and regrated. Afterwards the "Santan" was extracted by working and squeezing the grated meat with the least possible amount of water which was then diluted as described.

A determination was first made of the efficiency of this method of extraction. It was found that the residual mush contained 47.8 per cent. of oil (on dry basis). Thus only a little more than half the total oil originally in the meat is released in the form of milky emulsion—Santan.

One batch of this extract was allowed to ferment for 48 hours freely exposed to the atmosphere. A sour-smelling aerated scum developed from which three species of bacteria—two gas-forming and one souring—were isolated in pure culture. After sterilization, three further batches of santan were each separately inoculated from one of these cultures.

In no case did a water-white oil separate, although it was obvious the scum was oily in character. When this scum was removed and heated only a few grams of dark oil separated.

It is obvious that the process has little practical utility, for the yield is unsatisfactory while it is also difficult to check the development of objectionable flavours.

Received for publication 16th June 1938.

† "gata" corresponds to "Santan" or coconut milk.

THE COLONIAL EMPIRE MARKETING BOARD.

The recent past history of Colonial economic development has been one of growing realization by H. M. Government in the United Kingdom of their responsibility for promoting the economic welfare of the Colonial Empire. The creation of the Empire Marketing Board in 1926 was the first organized attempt to promote the marketing of Empire produce with the assistance of Government money and machinery, and the abolition of the Board in 1933 was much regretted by Colonies who had come to realize its value.

As a result of the careful examination of the question by an inter-Departmental Committee, His Majesty's Government have introduced a scheme to promote the marketing of Colonial produce in the United Kingdom and overseas. This scheme is supervised by a board called "The Colonial Empire Marketing Board" of which the Secretary of State for the Colonies is Chairman and which includes representatives of the business world, including the marketing side of Colonial products.

Although the Board is an autonomous body with executive and not merely advisory functions, yet in choosing particular problems to investigate the Board will have to rely at any rate in the early stages, almost entirely on suggestions submitted to them by organized producers, when such organizations exist, or by Colonial Governments and the Colonial Office itself, when producers are not organized. The activities of the Board in its early stages are to be directed mainly towards investigations into methods of marketing of Colonial products and towards the improvement of these methods. It also wishes to consider the promotion of Colonial marketing in the Dominions, as well as in the United Kingdom, European countries and the United States of America. At a later stage the principal functions of the Board will be to help and encourage the producers and distributors concerned to build up efficient marketing organizations of their own.

It appears that the Board is more concerned with minor products than with the major agricultural industries. They hold that such products as cocoa, tea, coffee, sugar, cotton, rubber, and the oil-bearing fruits such as copra, groundnut and palm kernels are established industries for which the Board can do little to alter, improve or extend the markets.

They look rather to a class of "specialist articles, branded articles, goodwill articles; articles the sale of which depends not only upon high quality, but upon the maintenance of that quality and in particular upon the *standardization* of the article so that it will be recognised by all its brand, name or mark."

The Board considers that there is considerable scope for discovering new markets and extending present ones for such products and they hope to make valuable contributions towards improvements in production and marketing as they maintain that methods of production, treatment, packing, handling and shipping can be improved year by year as new methods are learnt and experience acquired.

The address of the Board's office is 2 Sanctuary Buildings, 18 Great Smith Street, London, S.W.I., and the Secretary is Mr. H. C. H. Bull, A.C.A.

Reviews.

The Coconut: A Monograph.

By J. S. Patel, M.Sc. (Cornell), Ph.D. (Edin) Published by the Government Press, Madras, 1938. 313 p.p. Illustrated. Price 3 rupees 12 annas.

The Department of Agriculture of Madras maintains four research stations where for the past eighteen years coconut problems have been studied. The author has checked and correlated the published and unpublished work of these stations and has also referred extensively to the published work of others.

The chapter headings in this monograph are introduction; the culture; the root; the stem; the leaf; floral biology; manuring and cultivation; the yield; germination and selection; the nuts, copra and oil; coconut products; tapping; diseases and pests; and abnormalities of the coconut.

The chapter on culture is good, and those on root system and leaf deal very fully with their subjects. Floral Biology is the largest and one of the best chapters in the book. It deals with the development of the inflorescence, the relationship between spadix and leaf production, seasonal variation and abortion of spadices, pollination and setting of fruits.

Of the particular interest is the chapter dealing with variations in the yield of individual palms. Variations due to age, season, inherent character of palm, and rainfall are carefully examined. The effect of climate and season on the crop is, apparently, even more marked than in Malaya. The author concludes that the rainfall of the year previous to and of the year of harvest is significantly correlated to the yield, but states that he is unable to evaluate any exact mathematical relationship. He also records a significant seasonal variation in the character of the nuts and of the contained coconut meat.

The chapter on germination and selection of seed nuts is also well treated and contains information of interest and value.

In "Manuring and Cultivation" a great deal of information is offered regarding the effects of a number of manurial treatments, but the presentation of results is not always easy to follow. Furthermore the value of the observations must be open to some doubt as there seems to be no adequate system of randomised treatment nor sufficient control plots.

The manurial experiments have been in progress since 1922 at the Kasaragod station, the soil of which is a sandy loam, containing as much as 75 per cent. of fine gravel and coarse sand, according to the table of mechanical analyses on page 166. The soil is, therefore, of a very different nature to the clay soils in which plantation coconut palms are usually grown in Malaya. Manurial experiments were also carried out, between 1922 and 1931, at the three Nileshwar stations, but these are only very briefly reported.

A feature of interest in the chapter is the account of different responses to manurial treatments from heavy, medium, and poor-bearing palms. The importance of cultivation, especially in unirrigated coconut land, is briefly discussed.

The chapter on copra and oil is somewhat disappointing. The method of comparing the oil content of batches of copra by means of chekku oil mill

expressions which is much used by the author is difficult to accept in the absence of any proper examination of the degree of reliability of this method of determination.

The account of nut storage is of interest. In Malaya it is not possible to store nuts for such long periods as in Madras without serious spoilage, and the attempted production of "boll" copra by atmospheric drying of the whole fruit has also been a failure here, due to physiological or environmental causes.

Very brief reference is made to manufacture of copra, probably because in Madras this offers no particular difficulty, since manufacture is mostly confined to the dry season. There is an interesting reference to a trade in edible copra—small cups of superfine white copra for direct consumption—which has no parallel in Malaya. This copra is especially high priced and its production from selected dwarf palm nuts might reasonably be considered.

The section on coir production is most informative and it is interesting to learn that no less than 25,000 people are engaged in this industry on the West Coast. In Ceylon, where both bristle and coir yarn are produced, the industry is carried on in central factories, whereas in Madras it is a cottage industry and coir yarn is mostly the product.

There is also a long and interesting account of investigations into the production of toddy and jaggery and of the effect of tapping on the subsequent production of nuts.

The monograph contains a mass of information, and although in a few places dwarf palms are unsuitably referred to, and in some instances the information is not too well correlated, the book is a very acceptable addition to the literature on the coconut palm and should become a useful book of reference both for the practical agriculturist and for the research worker.

There is an extensive bibliography of nearly two hundred references to published work up to the end of 1934, and a good index.

R.B.J. AND F.C.C.

The Frameworking of Fruit Trees.

R. J. Garner and W. F. Walker. Occasional Paper No. 5 Imperial Bureau of Horticulture and Plantation Crops. 1938. pp. 19, bibl. 26. Price 1 shilling.

The authors set out briefly, the results of practical orchard experiments in Tasmania, England and elsewhere, on methods of topworking and thereby changing the variety of fruit trees at will.

The method commonly accepted in the past has consisted—to put it somewhat crudely—in chopping off the top of the tree and inserting one or two grafts into the stump. or into not more than the two or three branches which remain.

The method which they describe consists essentially in the insertion of a very large number of grafts right out at the ends of all the smallest branches. The labour involved is very much greater but the return of the tree to productivity is also greatly accelerated and would appear to make the practice worth while.

Four ways of carrying out the operation are described, namely, stub-grafting, inverted bark-grafting and awl-grafting. Line drawings greatly facilitate an understanding of the methods, while photographs showing an apple tree immediately after treatment and another similar tree two years after treatment demonstrate the results which can be expected.

Possible difficulties, choice of grafting wax, costs and other practical points are fully discussed.

Malayan Agricultural Statistics 1937.

D. H. Grist. Special Bulletin, Economic Series No. 9. Department of Agriculture, S.S. and F.M.S., 1938. Price $1/- (Straits Currency).

This seventh annual summary of Malayan agricultural statistics gives data up to the end of 1937.

The volume consists of 95 tables and 2 graphs and includes all available statistics concerning the Malayan areas, production, imports and exports, and market prices of such tropical crops as are grown in the Peninsula, or which at least theoretically although perhaps not economically, might be grown in this country.

The present publication follows the lines of its predecessors with certain modifications and additions, chief of which are tables showing the gross exports during the past few years to the principal importing countries of the major agricultural products of Malaya.

The volume furnishes a useful summary of local information regarding agricultural conditions in a convenient form for easy reference.

Annual Report for 1937 of The Rubber Research Institute of Malaya.

Published by The Rubber Research Institute, Kuala Lumpur, F.M.S. July, 1938, 211 pp. Price $1 (Straits currency.)

This volume consists of the Director's report, which covers 55 pages, the reports of the four Divisions of the Institute *viz.* Soils, Botanical, Pathological and Chemical, and the report of the Manager of the Experiment Station. Sections of the book are also devoted to the Report of the Board, Report of the London Advisory Committee for Rubber Research (Ceylon and Malaya), and a Statement of Accounts.

Information concerning the research investigations is confined to the reports of the Branches. The Director's report is devoted to an exposition of the policy of the Institute and the means by which this policy is being put into effect, while the lines of future developments are indicated.

The report is a model of its kind in that a clear-cut picture is given of the policy and activities of the Institute. It shows that not only is long-rang experimental work carefully devised, but the results of the work of the scientific staff will be made available to every class of rubber cultivator in the country.

Departmental.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE, 13th JULY 1938.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 13th July 1938, when in addition to a number of interesting discussions, several important statements were made defining the agricultural policy and outlining the schemes by which the policy will be put into effect. The following notes, drawn from the minutes of the meeting, concern the more important matters discussed.

Freight Rate on Copra.

The Chairman reported that the United Planting Association of Malaya has been informed officially that the basic freight rate on copra from the Straits to Shipping Conference ports in Europe from July 1st, 1938, will be as follows:—"Contract" (bags or bulked) 12 cwts. 35/- net; "Non-contract" (bags or bulked) 12 cwt., and "Compressed" (momichests and bales) 52 cubic feet, 44/- net.

The Pineapple Industry.

After referring to the progress made in the erection of the demonstration canning factory and laboratory at Johore Bahru, and to the position regarding standard can sizes, the meeting was informed of the introduction of the Malayan Mark Legislation. This legislation has been passed and published in the Straits Settlements and is now nominally in force in the Colony. It has also been passed by the Selangor State Council and will be published shortly in the Federated Malay States Gazette. In Johore the legislation will be brought up for approval at the next meeting of the State Council at the end of August. It appears that several canners are prepared to make use of the Malayan Mark as soon as the regulations are passed and the Canning Officer has been asked to request packers to prepare consignments accordingly.

Statistical Position. The meeting was informed that packers have petitioned Government concerning the introduction of measures to regulate planting and factory production and the general principles of the proposed scheme was explained.

Anti-Erosion Measures in Malaya.

The Chairman stated that his memorandum to Government on this subject was circulated to members and helpful comments were received from Messrs. Page, Reis and Stanton. He considers that nothing further can be done in this connexion until a reply to his memorandum has been received from Government. The possibility of enforcing anti-erosion measures through existing legislation was discussed, as was also the question whether existing legislation provides for measures to retain soil fertility or only against damage done by silt. It was agreed that nothing can usefully be done until a special board to consider this subject has been appointed by Government.

Tin Tailings and Slimes.

At the Chairman's invitation the Chief Research Officer made a statement on the above subject.

Mr. Belgrave stated that it has long been accepted that even very small quantities of mining slimes are injurious to padi and in consequence very strict control is imposed on mines from which the effluent might get onto padi areas—in general this limit is 40 grains per gallon in the padi irrigation water as opposed to 800 grains per gallon for mines more fortunately situated.

It was decided in 1937 that more exact information was desirable and as a preliminary, an elaborate pot culture experiment was conducted at Headquarters using padi soil and slimes from a mine in Selangor. Slime concentrations of 35-560 grains per gallon were employed. Figures for yield, height and tillering showed that the slimes were beneficial. Pot culture work must always be repeated in the field and in this case repetition is the more necessary in that factors such as speed of flow and aeration may have reversed the effect that would be produced under field conditions.

With the co-operation of the Mines and Drainage and Irrigation Departments an area of 9 acres has been selected at Beranang on which the effect of slime at concentrations of approximately 400 and 200 grains per gallon will be tested against control plots irrigated with uncontaminated water.

Mr. Belgrave added that even if this particular field experiment confirms the pot culture results, the question will not be settled for the whole of Malaya, because slimes differ in their chemical composition—some may contain arsenic and some certainly are calcareous; small quantities of arsenic and large quantities of calcium and mangesium carbonates may or may not injure padi. A systematic chemical examination of slimes from mines in all parts of the country has begun and will be continued.

Tin Tailings. Mr. Belgrave referred to Sir Frank Stockdale's suggestion that experiments with the planting of vitex and cinnamon on old tin tailings might be tried. He said that it has been decided that systematic experiments will be required and before these are undertaken it will be necessary to obtain analyses of tailings in various localities in order to classify their various types. In view of the shortage of staff in the Soils Division it will be necessary to postpone this work for at least another year.

The Chairman stated that this question of tin tailings was raised shortly after his arrival in Malaya and he decided that haphazard, isolated experiments in cultivation of plants thereon were useless, until it became possible to classify the types of soil generally found in such tailings. He added that wherever possible mines are called upon to put a deposit of fine material, *i.e.* "slimes" on top of their tailings by means of paddocking.

In subsequent discussion it was agreed that information on this subject is greatly needed as the question of prospecting for tin in land reserves is affected.

Grading Small Holders' Rubber.

The Chairman invited the Director, Rubber Research Institute of Malaya, to make a statement on this subject. Mr. Page said that it has been decided to explore further the possibility of introducing the price-grading scheme for rubber on the lines of the scheme now working in Pahang, where dealers exhibit in their shops a board showing the latest Singapore prices together with their own prices and samples of the varying grades of rubber. From the results obtained in Pahang the scheme appears to be a promising one. Residents, Resident Councillors and Advisers have been addressed on this question and the scheme is now being tried in parts of Perak and Brunei, Selangor, Malacca and Trengganu. Province Wellesley and Penang are still doubtful about its introduction and measures are being further considered in Johore. The general attitute in Selangor is still unfavourable as is that of Kelantan; but in view of the fact that so much still remains to be done in improving the small-holders' product in Kelantan it is scarcely worth while trying to introduce the scheme there at the present time.

Mr. Page stated that it has been decided to initiate experiments in physical grading. This has so far only been done in one District in Selangor. In this locality the Asiatic Rubber Instructor actually grades on one day a week rubber brought in by small-holders.

The meeting was informed that physical grading of rubber was tried in Muar (Johore) with reasonable initial success, but in order to break down the scheme dealers offered better prices for unsmoked sheet. Another speaker stated that when judging small-holders' sheet at an agricultural show in Province Wellesley recently he found the sheet to be very much better than ever before.

Rubber Instructors—New Appointments.

The Director, Rubber Research Institute of Malaya, reported that following a decision to expand the Small-Holders' Advisory Service, *i.e.* to increase the present cadre to a total of about 50 officers during the next five years, 5 new officers have been appointed. The present cadre of Asiatic Rubber Instructors totals 29, distributed as follows:

Perak	4	Malacca	3
Negri Sembilan	2	P.W. & Penang	2
Pahang	3	Singapore and Johore	6
Selangor	3	Kedah	2
Sungei Buloh Station	1	Kelantan	1
On leave	1	Brunei	1

He added that 3 demonstrators have also been appointed. These officers accompany Asiatic Rubber Instructors and follow up their instructions by several days' practical demonstration in each locality. The results obtained appear fully to justify these appointments.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

July, 1938.

The Weather.

Over the whole of the western areas drought conditions previously reported continued. Lack of adequate supplies of water has become a problem in many centres.

Conditions in Penang were better and frequent showers in the second half of the month brought the total rainfall to normal. The drought on the mainland was unbroken.

In Negri Sembilan, although the weather has been very dry, showers of rain have done something to mitigate conditions.

In Singapore, precipitation was up to average and in South Johore also showers did something to relieve the drought though the total rainfall was well below average.

Pahang also experienced hot and dry weather but there was some rain and conditions were nearer to normal than in any of the western States.

Kelantan experienced ample and well distributed rainfall throughout the month, the total precipitation being up to average.

Remarks on Crops.

Rubber.—From the 1st of July the quota was reduced to 45 per cent. and results have been quickly noticeable. Coupons are in great demand and have reached a value of $24 per picul equivalent. Prices of rubber with coupons has appreciated steadily throughout the month reaching a final value of $32 per picul. Uncouponed rubber is still only worth $5 or $6 per picul.

Despite the rise in the price of rubber there does not appear to be an increase in the amount of tapping. This can perhaps be ascribed to the fact that the high price obtainable for coupons makes it unprofitable for small proprietors to employ labour for tapping when the increased return is only some $6 per picul; and also that many small holders are busy with their padi cultivation.

The rubber grading scheme in Pahang appears to be operating satisfactorily, and dealers are eager to co-operate. Interest among the small holders in the manufacture of good quality sheet is maintained—in south Pahang alone 6 new smoke cabinets were erected during the month, bringing the total in this circle up to 87. It is worthy to note that the Pahang entries swept the board at the recent Malayan Exhibition in Kuala Lumpur.

In Kelantan also many demonstrations of rubber manufacture have been given and propaganda is constantly maintained. As the dealers pay a premium of $2.50 for good sheet, these efforts are meeting with success.

July 1st saw the inauguration of the new scheme under the Restriction Regulations for the allocation of new planting rights. These rights in the form of 1/20th acre coupons were handed out to small-holders when the quarterly rubber coupons were distributed. Some of the early recipients sold their rights for as little as 50 cents per coupon; $1.20 to $1.50 is, however, now being received. There is apparently a lively trade in these rights and Chinese dealers are reported to be buying in large quantities. It is feared that there will not be much new planting done by small-holders as few can resist this opportunity to obtain ready cash.

Padi.—The drought has almost brought cultivation to a standstill in many districts. A number of the irrigation areas have felt the water shortage and even in the old established irrigation areas in Krian the cultivators have shown considerable anxiety and have not been willing to continue planting until they are sure of adequate water.

Padi in the nurseries has been particularly prone to insect attack and such attacks have been difficult to control owing to the impossibility, in a great many cases, of flooding the nurseries.

In Krian the total crop for the 1937-38 season was approximately 570,000 piculs; of this 158,000 piculs (28 per cent.) were bought by Government Rice Mills. About 100,000 piculs (18 per cent. of the crop) of Seraup 48 received the 10 cent bonus.

Coconuts.—The value of copra appreciated slowly throughout the month and at the close had risen by about 30 cents. During the dry weather much sun-dried copra was made.

Pineapples.—In Johore the prices paid for fresh fruit for canning have shown an appreciable increase. Canners are now paying the following prices for fruit:—

First quality	$1.80	to	$2.10	per 100
Second ,,	1.50	to	1.70	,, ,,
Third ,,	.80	to	1.00	,, ,,

This improvement in price is probably due to competition among the canners to obtain the limited supplies of fruit now available. The price of canned pineapples has not increased appreciably.

In Selangor the prices paid to small cultivators are still only 40 to 50 cents per 100. Estate-grown pineapples, however, received a slightly better price.

Livestock.—Pigs. The live-weight price of pigs reached a new low level record, $10.50 per picul being recorded from Penang, which compares with $21.00 paid a few months ago. Large numbers of swine from Province Wellesley are now being marketed in Penang, and supply is in excess of demand. Exports from Penang to Singapore have recently been undertaken and found to be profitable.

Cattle. Cattle occupies a far larger place in the agriculture of Kelantan than in any other State of Malaya. Following the recent tour of the Adviser and Sir Frank Stockdale, the policy of the Department in Kelantan has lately been modified to accord this aspect of Kelantan agriculture the attention it deserves.

The work of laying out the livestock experiment station at Melor and the building up of a foundation herd of cattle is proceeding and mixed farming experiments have been commenced.

Some 300 head of cattle are reported to have died from a disease which has not yet been identified, but it is thought to have been introduced probably from Siam. The disease is reported to be now on the wane.

Kapok.—Although kapok is a well-known tree in many parts of Malaya, little attention is paid to its cultivation. In Lower Perak, however, it is quite an important local industry and four Teluk Anson dealers purchase about 142 piculs per year, all of which is sold in the District. The crop is grown in the riverine mukims on banks and islands of the Perak River.

In Teluk Anson two grades are recognised—cleaned and uncleaned. "Cleaning" consists of breaking up the pods and removing only the larger pieces. At the present time "cleaned" kapok realises $12 to $14 per picul and uncleaned $6 to $8. The only seedless kapok on the local market is imported from Java. Again there are two qualities selling at 30 cents and 25 cents per kati respectively. The former quality is much superior to the latter one. If local kapok had the pieces of pods and the seeds removed the product would be superior to the second quality imported product

DEPARTMENTAL NOTES.

Demonstration at the Malayan Exhibition, 1938.

The Department of Agriculture staged a demonstration of the use of a hand press for the extraction of palm oil, at the fifteenth Malayan Exhibition held at Kuala Lumpur on July 31st and August 1st and 2nd., 1938.

The description of this press was the subject of an article in *The Malayan Agricultural Journal* of February, 1938.

The demonstration attracted considerable attention, and appealed to visitors by reason of the simplicity, ease of working and low cost of the system. The adopton of this system makes possible the economic cultivation of areas of about 20 acres of palms.

A full account of the Exhibition will be included in the next number of this journal.

The Rural Lecture Caravan in Penang and Province Wellesley.

The Rural Lecture Caravan made a successful tour of Penang and Province Wellesley during the period 18th June to 6th July, 1938. Thirteen localities were visited, and the total attendance is estimated at 15,000.

An inovation was introduced by the inclusion of two Chinese nights in Penang, one at Balik Pulau and one at Sungei Ara, when lectures were given in Chinese on rubber and soil erosion.

The Caravan was present at the Bukit Mertajam (Province Wellesley) Agricultural Show, where unfortunately sufficient space was not available for showing the films; the Caravan exhibits were, however, usefully used for the Departmental display.

Appointments.

Mr. Gunn Lay Teik, Assistant Analyst, Department of Agriculture, S.S. and F.M.S., has been appointed Chemist, Department of Agriculture, S.S. and F.M.S., with effect from 1st. July, 1938.

Leave.

Mr. H. S. Simpson, State Agricultural Officer, Pahang, has been granted 254 days leave from 15th July, 1938, inclusive.

Mr. C. H. Burgess, Agricultural Officer, returned from leave on 29th June, 1938, and assumed duty in the post of State Agricultural Officer, Pahang, on 1st July, 1938.

Mr. H. K. Ashby, Agricultural Officer, Singapore, has been granted 227 days leave from 15th July, 1938, inclusive. Mr. P. V. Ormiston assumed duty in the post of Agricultural Officer, Singapore, on 15th July, 1938.

Mr. N. C. E. Miller, Entomologist, returned from leave on 28th July, 1938.

FERTILIZER PRICES, JULY, 1938.

The following are the prices at the end of July, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20 00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

Statistical.

MARKET PRICES.

July 1938.

Major Crops.

Rubber.—The steady improvement of prices reported in June continued during July. The price in Singapore opened at 23¼ cents per lb. and closed the month at around 26¾ cents. The average price for the month of No. 1. X. Rubber Smoked Sheet was 25.11 cents per lb. in Singapore, as compared with 20.27 cents in June. The London average price was 7.44 pence per lb. and the New York price 15.21 cents gold, as compared with 6.06d., and 12.36 cents gold per lb. in the previous month.

Prices paid for small-holders' rubber at three centres during June are shewn in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, July, 1938.

(Dollars per picul (133 1/3 lbs.))

Grades	Kuala Pilah, Negri Sembilan				Kuala Kangsar, Perak	Batu Pahat, Johore.		
	7	14	21	28	20	13	20	27
Smoked Sheet ...	31.00	30.00	31.25	—	30.00	—	29.50	—
Unsmoked Sheet ...	29.00	28.11	29.00	30.00	28.00	27.80	—	29.10
Scrap ...	No purchases							

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchase at Kuala Kangsar on 6th, 13th and 27th July, or at Batu Pahat on 6th July.

Palm Oil.—Prices improved during the month, as is shewn in Table II. The average of the weekly quotations in June was:—palm oil £13-8-1½ per ton, kernels £8-13-1½ per ton.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.		Palm Oil in Bulk, c i f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
		per ton	per ton
July	1	£ 14. 0. 0	£ 8. 15. 0
,,	8	14. 0. 0	8. 17. 6
,,	15	14. 15. 0	9. 0. 0
,,	21	15. 0. 0	9. 0. 0
,,	29	15. 0. 0	8. 15. 0
Average July		£ 14. 11. 0	£ 8. 17. 6

Copra.—The price of copra in July was fully up to the more favourable prices recorded during the latter part of June. Prices shewed but little fluctuations, the highest Singapore quotation for sun-dried being $3.75 and the lowest $3.50 per picul. The average for the sun-dried grade was $3.66 per picul, as compared with $3.04 in June.

Copra cake remained steady at $2.10 per picul until the last week of the month, when it dropped 5 cents. Average price in July was $2.09 per picul.

Rice.—The average wholesale market prices of rice per picul in June were as follows: – Siam No. 2 ordinary $4.25, Rangoon No. 1 $3.95, Saigon No. 1 $3.87, as compared with $4.16, $3.90 and $3.92 respectively in May and $3.91, $3.57 and $3.65 respectively in June 1937.

The average retail prices in cents per gantang of No. 2 Siam rice have remained unchanged throughout the year at Singapore 28, Penang 32, and Malacca 28.

The average declared value of imports during June was $3.88, as compared with $3.92 in May and $3.90 in June 1937.

Padi.—The Government Rice Mills, Perak, paid $2.10 per picul for padi. Prices in the Districts showed little variation over those ruling during the previous month. In the main rice-growing areas the price was between $8 and $9 per 100 gantangs, higher prices ruling in small padi areas, and up to $14 per 100 gantangs in towns and non-padi producing districts.

Pineapples.—Prices have tended to steady with a slight upward movement on reports of small pack and better enquiry. The following are the average prices per case of 48 tins of 1½ lbs. each:—G.A.Q. Cubes $2.67, Sliced Flat $2.62, Sliced Tall $2.75; Golden Quality $2.86, $2.81 and $2.92 respectively.

The pineapple season was practically at an end and greater competition amongst canners for supplies resulted in higher prices. From 60 cents to $1.35 per 100 was paid at Singapore factories. In south Johore only 3 factories were working and prices of fresh fruit was per 100 1st. quality $1.80 to $2.10, 2nd. quality $1.50 to $1.70, 3rd. quality 80 cents to $1. Negri Sembilan prices were quoted at from $1.50 to $2.50 per 100, while in the pineapple growing districts of Selangor the price remained low, being 40 to 50 cents per 100 for fruit from small-holdings and 70 cents per 100 from estates.

Beverages.

Tea.—Ten consignments of Malayan tea comprising 635 packages were sold on the London market during July. Two consignments (144 packages) were upland tea and 8 consignments (491 packages) were lowland tea. The upland tea sold at prices between 1s. 1½d. to 1s. 2½d. per lb., the average being 1s. 2d., while the prices realized for the lowland tea varied from 1s. 0¾d. to 11d., the average price being 11.75d. per lb.

Average London prices per lb. during July for consignments of tea from other countries were as follows:—Ceylon 1s. 2.35d., Java 11.96d., Indian Northern 1s. 1.34d., Indian Southern 1s. 0.95d., Sumatra 10.79d.

The latest Colombo average prices available, quoted from ***The Ceylon Tea Market Report***, 26th. July, 1938, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Teas 79 cents, Medium Grown Teas 72 cents, Low Grown Teas 64 cents.

Coffee.—Palembang coffee prices were lower than in June; from $10 to $11 per picul, depending on quality, was quoted throughout the month. Sourabaya coffee appreciated sharply, averaging from $13.75 to $14.50 per picul. Average prices in the previous month were, per picul, Palembang $11.85 to $13.10, Sourabaya $6.70 to $8.65.

Prices in Singapore for other varieties of coffee were quoted throughout the month at (per picul): Liberian $14.50, Excelsa $9.50, Robusta $6.00.

Spices.

Arecanuts.—Prices of splits and wholes appreciated slightly, while slices showed a considerable advance on June quotations. The range of average Singapore prices —depending on quality—during July were as follows:—Splits $4.62 to $7.44; Red Whole $4.69 to $6.05; Sliced $8.31 to $11.75 per picul.

The average of Singapore Chamber of Commerce quotations per picul were:— Best $7.32, Medium $6.88, Mixed $6.20.

Pepper.—Prices remain low on utter lack of demand. Average Singapore prices per picul in July were as follows:—Black $8.22, White $13.65, Muntok $13.90, as compared with $8.06, $13.44 and $13.09 respectively in June.

Nutmegs.—Prices of both 110's and 80's dropped early in the month, but recovered during the latter part of July. The average price per picul for both 110's and 80's were $28.60, as compared with $30 in June.

Mace.—The closing price of Siouw mace in June was $82 per picul; the price dropped another $2 in July, the average price being $80.40. Amboina dropped from $68 per picul to $62, the average price being $63.20 per picul. Corresponding average prices in June were $86 and $71 per picul respectively.

Cloves.—Nominal prices were again quoted throughout the month at $40 per picul for both Zanzibar and Amboina cloves.

Cardamoms.—The latest available price of green cardamoms as given in *The Ceylon Chamber of Commerce Weekly Report* of 25th July, 1938, is from Rs. 1.20 to Rs. 1.34 per lb.

Miscellaneous.

Derris.—The market conditions for derris remained unchanged, root sold on rotenone basis being quoted at $22 per picul, and on the basis of ether extract $14 per picul.

Gambier.—Block gambier was quoted throughout July at the previous month's figure of $7.50 per picul. Cube No. 1 dropped 50 cents to stand for the greater part of the month at $15 per picul, the average price being $15.10 per picul.

Tapioca.—Tapioca was quoted throughout July at the following figures per picul:—Flake Fair $4.10, Seed Pearl $3.90, Medium Pearl $4.75, as compared with June's average prices per picul of $4.10, $3.95, and $4.75 respectively.

Sago.—Pearl, Small, Fair was quoted throughout July at $3.75 per picul. Small fluctuations of price of Flour, Sarawak Fair were experienced the price ranging between $2 and $2.10 per picul, with an average price for the month of $2.05. Average prices in June were $3.56 and $1.79 per picul respectively.

Tobacco.—Uncured leaf was usually sold at prices between $2 and $7 per picul. Cured leaf prices varied widely according to the district and to quality. In general, however, the range of prices per picul was as follows:—grade I $30 to $60, grade II $25 to $50, grade III $16 to $30. Kelantan prices for prepared tobacco remain high: grade I $100 to $160, grade II $80 to $128, grade III $60 to $112. On the other hand, Penang and Kedah prices were low I $34 to $38, II $25 to $28, III $16 to $18.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for imported coffee and arecanuts by the Lianqui Trading Company of Singapore, and derris prices by Messrs Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.— The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY*

June 1938.

Malaya.—Imports of foreign rice during June were 68,201 tons† and exports 13,489 tons, net imports being 54,712 tons as compared with 44,958 tons in 1937.¶

Of the June imports 48 per cent. were consigned to Singapore, 20 per cent. to Penang, 7 per cent. to Malacca, 18 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets): Siam 43,168 (63.3), Burma 22,362 (32.8), French Indo-China 1,431 (2.1), other countries 1,240 (1.8).

For the first half year 1938, total imports of rice into Malaya amounted to 398,368 tons of which 63.1 per cent. was Siam rice and 32.8 per cent Burma rice. For the period January to June 1937, the total imports were 322,303 tons. Net imports of rice for the inclusive period January to June 1938 were 302,270 tons, as compared with 264,344 tons in 1937.

Of the exports during June 1938, 77 per cent. were consigned to the Netherlands Indies and 23 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets): Siam 11,035 (81.8), Burma 2,026 (15.0), French Indo-China 347 (2.6) parboiled 44 (0.3), local production 37 (0.3).

India and Burma.—Foreign exports from India for the period January to May 1938 were 119,000 tons as compared with 573,000 tons in 1937, a decrease of 79.2 per cent. Of these, 4.2 (4.6) per cent. were to the United Kingdom 6.7 (6.6) per cent. to the Continent of Europe, 35.3 (26.5) to Ceylon, 5.1 (24.1) to Straits Settlements and Far East, and 48.7 (38.2) per cent to other countries. The percentages in brackets are for 1937.

Burma's exports from 1st January to 22nd June totalled 1,928,423 tons as compared with 1,891,176 tons in 1937, an increase of 2 per cent. Of these, 42.5 (46.7) per cent. were to India, 9.1 (8.3) per cent. to the United Kingdom, 8.0 (9.1) per cent. to the Continent of Europe, 10.5 (10.4) per cent. to Ceylon, 13.7 (12.0) per cent. to the Straits Settlements and the Far East, and 16.2 (13.5) per cent. to other countries. The figures in brackets are for 1937.

Siam.—Exports of rice and rice products from Bangkok during April were 152,451 tons as compared with 75,398 tons in 1937.

Japan.—According to the official estimate of 29th June, 1938, of the first Formosan rice crop for the season 1938, the area under rice, at 713,189 acres, shows a market decrease, the figure for 1937 being 729,239 acres, and that of 1936 744,827 acres.

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* Abridged from the Rice Summary for June, 1938 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Conditions of growth have been good, and estimated production shows an increase of 5.4 per cent. over the actual crop of last year. The policy of reducing acreage to allow for substitute crops, while maintaining the production level, continues to have effect.

The estimated production of the first crop of 1938 is 652,066 tons, as compared to actual production in 1937 of 618,711 tons and in 1936 of 664,559 tons.

French Indo-China.—Entries of padi into Cholon during the first half year 1938 were 697,041 tons, as compared with 856,024 in 1937, a decrease of 18.6 per cent. Exports of rice during the same period were 694,620 tons, as compared with 786,334 in 1937, a decrease of 11.7 per cent.

The Saigon rice report for June states that the demand for rice from abroad (non-French countries) has decreased, owing to the high prices ruling, and the same tendency was noticeable in the French demand, after it had remained strong during the whole month.

Ceylon.—Imports of rice during the first half year 1938 were 279,364 tons, as compared with 274,089 tons in 1937, an increase of 1.9 per cent. Of these imports, 17.3 (17.0) per cent. were from British India, 71.5 (69.2) per cent. from Burma, 0.3 (0.1) per cent. from the Straits Settlements, and 10.9 (13.7) per cent. from other countries. The percentages in brackets are for 1937.

Europe and America.—Shipments from the East to Europe from 1st January to 10th June totalled 710,852 tons, as compared with 641,511 tons in 1937, an increase of 10.8 per cent. Of these shipments, 46.0 (47.2) per cent. were from Burma, 44.6 (44.4) per cent from Saigon, 7.6 (5.8) per cent. from Siam and 1.8 (2.6) per cent. from Bengal. The figures in brackets are the corresponding percentages for 1937.

Shipments for the Levant from 1st January to 9th June were 21,840 tons, as compared with 7,619 tons in 1937, an increase of 186.7 per cent.

Shipments for Cuba, West Indies and America from 1st January to 25th May were 88,828 tons as compared with 130,651 tons in 1937, a decrease of 32.0 per cent.

MALAYAN AGRICULTURAL EXPORTS, JUNE, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./June 1937	Jan./June 1938	June 1937	June 1938
Arecanuts ...	30,084	16.836	22,257	3,502	4.514
Coconuts fresh † ...	95,223†	42,418†	50,453†	9,439†	14,039†
Coconut oil ...	39,762	18,020	21,259	3,467	3.674
Copra ...	75,592	27,573	18,442	5,263	3.455
Gambier, all kinds ...	1,955	989	734	139	122
Copra cake ...	15,026§	6,095§	3,340§	285§	954§
Palm kernels ...	7,312	2,768	4,302	233	710
Palm oil ...	42,787	20,614	25,570	4,325	4.971
Pineapples canned ...	80,502	46,728	42,698	10,296	9.009
Rubber ¶ ...	503,127¶	230,741¶	203,242¶	51,569¶	37,793¶
Sago,—flour ...	15,478	8,297	1,687	144*	532*
,, —pearl ...	3,759	1,471	1,939	132	240
,, —raw ...	8,256*	3,885*	3,046*	787*	279*
Tapioca,—flake ...	1,058	594	478	99	98
,, —flour ...	2,393*	855*	2,087*	27	447*
,, —pearl ...	18,786	8,461	8,345	1,367	1,507
Tuba root ...	573	324	207	62	52

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
Total ...	11,870.6	8,993.9	2,145.2	1,560.0
Total January to June, 1937 ...	10,375.3	8,324.3	1,897.4	1,385.7
Total for the year 1937 ...	27,733.5	17,982.8	5,094.7	2,811.4

Stocks on estates as at 30th June, 1938 were: palm oil 2,424 tons, palm kernels 581 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH JUNE, 1938

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber Not Tapped: Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Otherwise than under rotational systems: Percentage of (7) to (2)	Under rotational systems: Acreage	Under rotational systems: Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Area never tapped: Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,302	22,015	50.8	662	1.5	12,155	28.1	8,470	19.6	409	0.9	21,287	49.2
Malacca ...	121,868	66,077	54.2	2,692	2.2	22,148	18.2	30,951	25.4	2,114	1.7	55,791	45.8
Penang ...	2,488	1,313	52.8	258	10.4	857	34.4	60	2.4	36	1.4	1,175	47.2
Singapore ...	32,384	17,004	52.5	3,792	11.7	6,447	19.9	5,141	15.9	103	0.3	15,380	47.5
Total S.S. ...	200,042	106,409	53.2	7,404	3.7	41,607	20.8	44,622	22.3	2,662	1.3	93,633	46.8
F. M. S.—													
Perak ...	286,794	169,458	59.1	3,944	1.4	57,771	20.1	55,621	19.4	6,775	2.4	117,336	40.9
Selangor ...	324,476	209,347	64.5	5,983	1.9	45,213	13.9	63,933	19.7	6,279	1.9	115,129	35.5
Negri Sembilan ...	254,088	155,347	61.1	6,996	2.8	40,941	16.1	50,804	20.0	7,493	2.9	98,741	38.9
Pahang ...	86,420	53,296	61.7	3,528	4.1	19,224	22.2	10,372	12.0	6,342	7.3	33,124	38.3
Total F.M.S. ...	951,778	587,448	61.7	20,451	2.2	163,149	17.1	180,730	19.0	26,889	2.8	364,330	38.3
U. M. S.—													
Johore ...	475,817	309,891	65.1	8,832	1.9	88,353	18.6	68,741	14.4	33,338	7.0	165,926	34.9
Kedah ...	195,949	125,668	64.1	6,511	3.3	23,994	12.3	39,776	20.3	6,941	3.5	70,281	35.9
Kelantan ...	31,188	21,269	68.2	223	0.7	5,711	18.3	3,985	12.8	1,934	6.2	9,919	31.8
Trengganu (b) ...	4,817	3,182	66.1	nil	nil	74	1.5	1,561	32.4	74	1.5	1,635	33.9
Perlis (c) ...	1,371	858	62.6	216	15.8	257	18.7	40	2.9	84	6.1	513	37.4
Brunei ...	5,689	2,988	52.5	nil	nil	1,885	33.1	816	14.4	281	4.9	2,701	47.5
Total U.M.S. ...	714,831	463,850	64.9	15,782	2.2	120,274	16.8	114,919	16.1	42,652	6.0	250,975	35.1
Total MALAYA ...	1,866,651	1,157,713	62.0	43,637	2.4	325,030	17.4	340,271	18.2	72,203	3.9	708,938	38.0

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYA RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JUNE, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to June 1938		during the month		January to June 1938						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1938	during the month	Jan. to June 1938	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	8,912	14,762	10,820	68,801	7,867	33,650	Nil	Nil	Nil	Nil	10,536	6,739	75,761	24,676	...	9,944	15,125	17	92
Johore ...	...	3,683	6,164	4,952	31,787	5,094	19,948	Nil	Nil	Nil	105	2,782	5,954	19,148	13,169	...	5,005	6,152	...	...
Kedah ...	...	323	3,937	2,601	17,166	1,039	5,461	Nil	Nil	Nil	Nil	1,484	2,255	11,130	11,465	...	325	3,836	...	...
Perlis ...	...	19	32	11	82	25	139	Nil	Nil	Nil	Nil	Nil	41	Nil	200	...	20	26	...	...
Kelantan ...	...	606	385	383	2,181	1,127	4,001	Nil	Nil	Nil	Nil	281	1,032	1,647	4,433	...	798	390	...	...
Trengganu ...	...	55	50	211	1,620	105	810	Nil	Nil	Nil	Nil	Nil	316	Nil	2,430	...	55	50	...	...
Brunei ...	...	15	59	54	280	111	429	...	...	...	...	...	185	...	730	...	Nil	54	...	...
Total Malay States	...	13,613	25,389	19,032	121,917	15,368	64,438	Nil	Nil	Nil	105	15,083	16,522	107,686	75,103	...	16,147	25,633	17	92
S. SETTLEMENTS :—																				
Malacca ...	...	2,326	1,513	1,082	6,976	1,172	3,808	Nil		Nil		2,473		14,926		...	2,400	1,655	...	...
Province Wellesley	...	1,578	704	391	2,577	345	1,457	Nil		Nil		6,436		45,764		...	2,454	738	...	...
Penang ...	2,676	5,148	13	19	112	141	570	2,414	13,939	13,341	77,397		Nil		Nil	2,754	5,751	7	...	...
Singapore ...	3,733	29,053	241	133	924	88	382	11,939		65,020		18,266		112,073		4,558	31,675	207	25	149
Labuan ...	..	49	Nil	Nil	Nil	22	81	41		281		Nil		Nil		...	49	Nil	...	...
Total Straits Settlements ...	6,409	38,154	2,471	1,625	10,589	1,768	6,298	14,394	13,939	78,642	77,397	27,175	Nil	172,763	Nil	7,312	42,329	2,607	25	149
Total Malaya ...	6,409	51,767	27,850	20,657	132,506	17,136	70,736	14,394	13,939	78,642	77,502	42,258	16,522	280,449	75,103	7,312	58,476	28,240	42	241

TABLE II
DEALERS' STOCKS. IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	8,882	30,475	5,570	4,625	4,122	121
WET RUBBER	1,062	1,200	181	278	883	204
TOTAL ...	9,944	31,675	5,751	4,903	5,005	325

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. to June 1938 31
Singapore ...	27,959	184,967
Penang ...	9,987	67,421
Port Swettenham.	4,037	26,752
Malacca ...	275	1,309
MALAYA ...	42,258	280,449

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. to June 1938 34
Malay States ...	31,575	182,405
Straits Settlements	2,807	15,738
MALAYA ...	34,382	198,143

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics S.S and F.M.S., at Singapore on 22nd July, 1938.

METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	91.2	72.3	81.7	94	70	88	74	84.7	85.4	2.68	68.1	0.76	10	8	2			227.15	7.57	61
Bukit Jeram, Selangor ...	90.8	73.0	81.9	94	70	88	75	86.8	87.6	2.76	70.1	1.22	6	3	2		1	256.75	8.56	69
Sitiawan, Perak ...	90.8	72.8	81.8	94	69	89	77	85.1	85.5	3.18	80.8	1.44	6	6	1			254.65	8.49	69
Ipoh Aerodrome, Perak ...	90.9	72.3	81.6	94	69	88	75	84.0	85.0	5.61	142.5	1.78	8	8	5		1	218.50	7.28	59
Temerloh, Pahang ...	91.6	72.6	82.1	94	70	85	75	86.7	87.2	2.84	72.1	1.58	7	6	2	7		227.25	7.57	61
Kuala Lipis, Pahang ...	90.6	72.2	81.4	93	68	86	75	85.1	85.8	1.43	36.3	0.86	8	5	3	20		180.95	6.03	49
Kuala Pahang, Pahang ...	87.9	74.8	81.3	90	72	82	79	87.0	88.0	6.42	164.3	2.78	6	5	4		4	249.85	8.33	68
Kallang Aerodrome, S'pore ...	87.3	77.5	82.4	89	71	80	82	83.8	84.3	6.05	153.7	1.70	9	7	2		2	247.80	8.26	68
Bayan Lepas Aerodrome Penang ...	88.2	74.5	81.3	90	71	85	77	84.7	85.4	4.61	117.1	2.22	13	7	2		2	229.30	7.64	62
Bukit China, Malacca ...	86.6	74.3	80.5	88	70	81	79	84.7	85.7	3.94	100.1	2.42	10	8	3		4	232.15	7.74	63
Kluang, Johore ...	88.9	71.4	80.1	92	69	77	75	82.7	83.2	2.64	67.1	0.75	12	11	1	4		201.05	6.70	55
Bukit Lalang, Mersing, Johore	87.6	72.2	79.9	90	70	77	75	83.2	83.1	2.44	62.0	0.57	10	8	1		2	212.25	7.07	57
Alor Star, Kedah ...	88.7	74.2	81.5	92	71	84	76	85.1	86.5	9.79	248.7	2.70	12		2	1	1	183.35	6.11	49
Kota Bahru, Kelantan ...	90.0	73.6	81.8	94	71	84	76	84.8	85.6	3.26	82.8	1.17	10	6	3		1	188.45	6.28	51
Kuala Trengganu, Trengganu	89.3	73.5	81.4	93	70	85	75	84.5	86.2	4.99	126.7	1.68	9	8	4		1	209.40	6.98	56
HILL STATIONS. Fraser's Hill, Pahang 4268 ft	75.4	63.3	69.3	79	62	72	65	73.1	73.3	2.71	68.8	2.45	7	3	5	7		221.80	7.39	60
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.0	54.8	63.9	76	49	69	59	70.9	70.9	3.34	84.8	1.26	13	11	2			178.85	5.96	48
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.1	59.8	66.5	77	58	68	61			3.17	80.5	1.39	13	9				194.05	6.47	52

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

SEPTEMBER, 1938

EDITORIAL.

Feeding Trials with Pigs.

Experiments devised to study the effect of the feeding of Chinese pigs with a scientifically balanced ration are described in an article from Messrs. T. D. Marsh and N. Kanagaratnam which we publish in this number. The results are remarkable in that they show that with suitable feeding weight is gained at almost double the rate normally achieved by the small-holding pig-keeper. The balanced ration, however, is considerably more expensive than the unscientific ration, so that the simple direct monetary advantage of the former ration is not as great as appears at first sight. The main advantage of scientific feeding is not only an improvement in the quality of the flesh, but early maturity, by which the breeder obtains a much quicker turnover of his capital—a matter which affects the profits and income derived by the breeder and feeder almost as much as the cost of food and the price obtained for his fat pigs.

Perhaps no results of investigations conducted by the Department of recent years are more immediately fruitful of practical application than those that relate to the pig industry. This industry is mainly in the hands of Chinese, some of whom possess herds of considerable numbers, while the keeping of a few pigs also enters into the economy of the Chinese small vegetable gardener. Recently too, Tamil peasantry on Settlements have successfully included pig keeping with the cultivation of market garden crops.

Hitherto, the Chinese pig-keeper has lost little time in appreciating the improvements made in breeding, and there is no doubt that the financial advantage of scientific feeding will equally appeal to him. Knowledge of this success in feeding quickly spreads and the most useful propaganda is that whereby the information is gained through demonstration. Pig breeding, however, is conducted throughout the country, and the publication of this information through the Chinese Agricultural Journal and the Chinese press in the near future will place Chinese breeders in possession of this information at an early date.

It is more difficult to bring these facts home to the Tamil pig-keepers, many of whom are illiterate or whose mentality is such that they can understand the written word only in its simplest terms.

We would appeal, therefore, to employers of Tamil labour engaged in pig-keeping to bring to their notice the important results which are here detailed.

Lalang Grass and Coconuts.

The fact that unchecked growth of lalang grass has an injurious effect on the growth of coconuts is well-known. In the article on another page on "The Effect of Lalang Grass (*Imperata arundinacea*) on Growth of Coconuts," Mr. R. B. Jagoe summarizes an experiment designed to measure this effect, under controlled conditions, on the growth and yield of dwarf coconut palms.

Under the conditions of this experiment, the palms were grown under three systems, *viz.*: with unrestricted lalang grass, clean weeded, and with a cover crop.

Measurements of growth and yield under each system show the remarkable deleterious effect of the presence of lalang grass, while trees grown with a cover crop were slightly superior to those grown on the clean weeded areas.

The Malayan Exhibition.

The fifteenth Malayan Exhibition, held as usual at Kuala Lumpur, has come and gone, and one is left wondering how far the hard work, the elaborate organization that has been built up, and the expense of staging an event of this nature is justified by results. We have heard the doubt expressed from time to time and without an intimate knowledge of the effect in the districts—and more particularly in the less accessible districts—such criticisms are not easily answered.

It may be accepted that essentially the Exhibition is in four parts: a trade exhibition for the more important import firms; an agricultural and horticultural show; a market for the arts and crafts of the villages, and an educational and demonstration centre for certain Government departments.

Dealing with these four points seriatim. It is to be assumed that the Agency houses and import merchants appreciate this opportunity of displaying their goods, otherwise they would not be exhibitors. It is noticeable that the greater part of the Exhibition is taken up by stands with exhibits of direct agricultural interest. The opportunity of showing these goods to practical agriculturists is unique and of mutual benefit.

The Agricultural Show is of restricted use unless carefully organized on a Malayan basis. The improvement in organization which is evident during the past few years has greatly added to the value of the Show. The small-holder takes a real pride in winning a prize at the Exhibition. and this must act as a stimulus to increased efforts to improve quality. The Agricultural Show is chiefly valuable in respect of products for which preparation is a factor of importance. For such products as rubber and copra, the Show organized on a Malayan basis has an educational value, for it provides a culminating point to the endeavours at the district shows throughout the country to demonstrate standards, and spreads knowledge of what constitutes good quality.

The development of the Exhibition as a market for village arts and crafts has in recent years been very marked. Those most conversant with village life appreciate the value to the villagers themselves of arts and crafts, for it not only makes for contentment in useful occupation, but the extra money is a welcome addition to slender incomes. The very considerable sales effected show the demand for such articles, while with wise guidance the villager is now making more useful articles than he used to do.

That the Exhibition is valuable for educational purposes is self-evident. One only has to witness the interest displayed in the exhibits of the Infant Welfare Section to be convinced.

We contend therefore that the annual Malayan Exhibition is performing a useful service to the country and we wish it continued success.

Original Articles.

FEEDING TRIALS WITH PURE-BRED CHINESE PIGS

BY

T. D. MARSH,

Agriculturist

&

N. KANAGARATNAM,

Stock Farm Assistant.

The Chinese breeds of swine in Malaya are generally considered to be slow to mature despite the standard practice of mating them (particularly boars) before they are fully grown.

Amongst live-stock authorities early mating is regarded as one of the methods whereby early maturity may be developed. The Chinese pigs appear to arrive at sexual maturity quite as early if not earlier than European pigs.

The experiment here described was undertaken with the piebald type of Chinese pig to find the difference in the rate of increase of live-weight in pigs fed on balanced rations and those fed under Chinese small-holding management.

The feeding experiment consisted of two carefully matched weaner groups (A) and (B) of 4 pigs each. These pigs were litter-mates from 14 farrowed on 3rd September, 1937 and weaned at the age of eight weeks. Group A, consisting of two castrated males and two females was brought to the Stock Farm, Serdang, and numbered, whilst the similar group (B) were also numbered and left with the Chinese breeder to be fed in the Chinese small-holding method.

The results of previous feeding trials with Middle White pigs carried out on this Station and published in *The Malayan Agricultural Journal* for March, 1938, led to the conclusion that Rations A1 and A2 gave good results with weaners and young pigs respectively. Therefore the same balanced rations as detailed hereunder were used in this experiment:—

Ration A1. (Balanced)

The quantities given are sufficient per day for 1,000 lbs. live-weight of pigs each averaging approximately 44 lbs.

Food	Quantity lbs.	Digestible protein. per cent.	Fat. per cent.	N-free extract per cent.	Dry matter per cent.
Broken rice ...	26	1.66	.08	20.77	23.03
Rice polishings ...	3	.21	.34	1.22	2.70
Coconut cake ...	5	.64	.43	2.34	4.41
Soya bean cake ...	11	4.01	.40	2.58	9.22
Guinea grass ...	10	.09	—	.79	2.50
Banana stems ...	20	.02	.02	.07	1.02
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	0.5	—	—	—	.50
TOTAL ...	76.5	6.63	2.27	27.77	44.38

Ration A2. (Balanced)

The quantities given are sufficient per day for 1,000 lbs. live-weight of pigs each averaging approximately 88 lbs.

Food	Quantity lbs.	Digestible protein. per cent.	Fat. per cent.	N-free extract per cent.	Dry matter per cent.
Tapioca tubers ...	50	.50	—	15.40	17.50
Rice polishings ...	6	.42	.68	2.44	5.40
Coconut cake ...	6	.77	.51	2.84	5.29
Soya bean cake ...	9	3.29	.32	2.11	7.54
Palm oil ...	1	—	1.00	—	1.00
Minerals ...	.50	—	—	—	.50
TOTAL ...	72.50	4.98	2.51	22.79	37.23

Chinese Ration B1. (Unbalanced).

Food	Quantity lbs.	Digestible protein. per cent	Fat. per cent.	N-free extract per cent.	Dry matter per cent.
Broken rice ...	3	.19	.009	2.39	2.65
Water hyacinth ...	3	.02	.002	.084	.17
Rice bran ...	5	.46	.94	1.45	4.62
Ikan busok ...	.5	.11	—	—	.25
TOTAL ...	11.5	.78	.951	3.924	7.69

Chinese Ration B2. (Unbalanced).

Food	Quantity lbs.	Digestible protein. per cent.	Fat. per cent.	N-free extract per cent.	Dry matter per cent.
Tapioca tubers ...	20	.2	—	6.16	7.00
Water hyacinth ...	10	.07	.01	.28	.59
Rice bran ...	10	.92	1.88	2 91	9.24
Soya bean cake ...	3	1.09	.10	.69	2.51
Ikan busok ...	1	.22	—	—	.50
TOTAL ...	44	2.50	1.99	10.04	19.84

Cost of Rations.

A 1 Ration.			Cost per lb.	Cost of 76.5 lbs. i.e. sufficient to feed 1000 lbs. pigs for one day
			cents	cents
Broken rice	26 lbs.	...	2.62	68.12
Rice polishings	3 lbs.	...	1.72	5.16
Coconut cake	5 lbs.	...	2.81	14.05
Soya Bean cake	11 lbs.	...	3.56	39.16
Red Palm Oil	1 lb.	...	10.00	10.00
Minerals	0.5 lb.	...	4.00	2.00
Guinea grass	10 lbs.	...		5.00
Banana stems	20 lbs.	...		

Ration 76.5 lbs. costs $1.43.
100 lbs. of ration will cost $1.87.
The concentrates alone cost $2.98 per 100 lbs.
76½ lbs. of this ration will feed for one day about 22 pigs each weighing about 45 lbs. or 1000 lbs. live weight of pigs.

A 2 Ration.			Cost per lb.	Cost of 72½ lbs. i.e. sufficient to feed 1000 lbs. pigs for one day
			cents	cents
Tapioca tubers	50 lbs.	...		34.00
Rice polishings	6 lbs.	...	1.72	10.32
Coconut cake	6 lbs.	...	2.81	16.86
Soya Bean cake	9 lbs.	...	3.56	32.04
Palm Oil	1 lb.	...	10.00	10.00
Minerals	.5 lb.	...	4.00	2.00

Ration =72½ lbs. cost $1.05.
100 lbs. of ration will cost $1.45.
100 lbs. of the concentrates cost $3.17.

It must be appreciated that 72½ lbs. of this ration will feed 1000 lbs. of pigs, each weighing about 88 lbs., or 11 pigs for one day.

These figures include the succulent 50 lbs. of tapioca.

Table I.

Comparative Weights of Individual Pigs in Groups A and B.

Dates.	Group A (Serdang Fed). Rations A1 and A2.						Group B (Holding fed) Rations B1 and B2				
	Age of pigs in days.	Barrow No. 83	Barrow No. 85	Gilt No. 91	Gilt No. 89	Total	Barrow No. 50	Barrow No. 73	Gilt No. 61	Gilt No. 47	Total
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
29.10.37* ...	56	12.0	11	11.25	10.75	45	12	11	11.25	10.75	45
30.11.37 ...	88	14.75	13.75	14.75	13.75	57	13	12	13	12	50
1. 1.38 ...	119	25	24	23	23.50	95.50	15	14	15.75	13.25	58
1. 2.38 ...	150	48	40	50	45	183	26	24	23	21	94
1. 3.38 ...	178	73	60	70	70	273	38	36	39	34	147
1. 4.38 ...	209	96	85	100	104	385	54	51	55	50	210
Total live-weight increase during experiment ...		84	74	88.75	93.25	340 85 av.	42	40	43.75	39.25	165 41.25 av.
Live-weight increase per day during experiment ...		.549	.483	.580	.610	2.222 .555 Average	.275	.261	.286	.257	1.079 .269 av.

* Start of Experiment.

Table III.

Table giving Comparative Increase in Live-weight Gain per Pig per Day.

Date	Age of pigs in days.	Interval between recording weights.	Group A (Chinese Pigs fed on Rations A1 & A2 at Serdang Farm.)			Group B (Chinese pigs on Rations B1 and B2, Holding fed)		
			Total weight of four pigs.	Average weight per pig.	Average live-weight gain per pig per day.	Total weight of four pigs.	Average weight per pig.	Average live-weight gain per pig per day.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
29-10-37	56		45	11.25		45	11.25	
30-11-37	88	32 days	57	14.37	.0975	50	12.50	.039
1- 1-38	119	31 „	95.50	23.87	.306	58	14.50	.065
1- 2-38	150	31 „	183	45.75	.706	94	23.50	.290
1- 3-38	178	28 „	273	68.25	.804	147	36.75	.473
1- 4-38	209	31 „	385	96.25	.903	210	52.50	.508

In a previous feeding trial at Serdang Middle White pigs fed on Rations A1 and A2 from the age of
63 days to 91 gained an average of .46 lbs. per pig per day.
91 — 119 „ „ 1.21 „ „ „
119 — 133 „ „ 1.09 „ „ „
133 — 147 „ „ .36 „ „ „
147 — 173 „ „ .63 „ „ „

Remarks on the Chinese Rations.

Assuming that the "dry matter" necessary for the normal appetite of pigs of specific weights are those as given by Kellner, the ration B1 is about 20 per cent. deficient in nitrogen-free extract and proteins, while there is an excess of crude fat. The ration B2 is deficient in nitrogen-free extract and again has excess fat.

The proportions of foods comprising the Chinese ration are detailed above, but it is unlikely the pig keepers weigh the constituents of the ration and the amounts recorded probably vary from day to day.

The tapioca and banana stems fed in rations A1 and A2 were cooked by steaming, while rations B1 and B2 were cooked by boiling in an open pan.

The experiment commenced with weaners at 56 days old. Group A received ration A1 from weaning for a period of 94 days, for a further period of 59 days they were fed on ration A2.

Th pigs in Group B fed by the Chinese squatter received ration B1 for one month after weaning and ration B2 from that age until the completion of the experiment which was a total period of 153 days.

The following are the results of the experiment:—

Table II.

Summary of Weights of Groups A and B at Different Stages of Growth.

Age of Pigs and Dates.		Group A (Serdang Fed. on Rations A1 & A2)		Group B (Holding Fed. on Rations B1 & B2)	
		Total wt. of four pigs.	Average wt per pig.	Total wt. of four pigs.	Average wt. per pig.
	From birth.	lbs.	lbs.	lbs.	lbs.
29-10-37	56 days	45	11.25	45	11.25
30-11-37	88 „	57	14.37	50	12.50
1- 1-38	119 „	95.5	23.87	58	14.50
1- 2-38	150 „	183	45.75	94	23.50
1- 3-38	178 „	273	68.25	147	36.75
1- 4-38	209 „	385	96.25	210	52.50

The difference between the average live-weight gains per animal in Groups A and B was 43.75 lbs. during the period of the experiment of 153 days.

Comments on the Results.

The average live-weight gains per pig per day during the experiment with Chinese pigs on rations A1 and A2 compared with B1 and B2 were 0.555 lbs. and 0.270 lbs. respectively, while the Middle White pigs on a previous trial at Serdang with Ration A1 and A2 gave a live-weight gain of .89 lbs. per day, which compares favourably with English standards.

The above tables show in comparison to previous trials with Middle White pigs on identical rations that store Chinese pigs require to be two months older than Middle Whites to reach the same average weights, but beyond this point of development they make similar live-weight gains per day, which suggests that Chinese pigs require two months longer to attain slaughter weight.

The concentrates consumed by Chinese pigs per pound live-weight gain at Serdang was 4.7 lbs. This figure was obtained by deleting 90 per cent. of moisture content of tapioca root, banana stems and Guinea grass in Rations A1 and A2 to make them comparable with the rest of the meals in the rations. The Middle White pigs at Serdang at similar ages and on identical rations required 3.01 lbs. of concentrates for one pound live-weight gain.

The amount of Ration A1 fed was 825 lbs. and A2 ration was 1,419 lbs., a total of 2,245 lbs. Therefore A1 ration adjusted for moisture content as above was 575 lbs. and A2 was 919 lbs. or a total of 1,494 lbs.

This experiment indicates that the live-weight increase of pigs fed on a balanced ration was almost double that of the pigs under this particular small-holding management.

Assuming that this small-holding management represents an average rate of feeding, these experiments indicate that Chinese pigs will gain in live-weight on balanced rations at almost double the rate normally achieved by the small-holding pig-keeper.

The dam of the litter of 14 from which the pigs were selected was four years old and, according to Chinese standards, reared the litter fairly well. It must, however, be emphasised that these weaners were at eight weeks only one-third of the weight of average European breed weaners and the characteristic of "good milkers" attributed to Chinese sows would appear to need qualification.

Chinese weaner pigs are invariably active and healthy, but owing to the lower mature weights of these pigs the young animals from birth to maturity are small when based on European standards.

At the termination of the experiment the pigs in Group A had comparatively straight backs while those in Group B had curved sunken backs, furthermore they had distended abdomens owing to their rations containing so much succulent vegetable matter. These characteristics show evidence of an adequate mineral supply in the rations fed to Group A and a deficiency in the rations of Group B.

Four pigs used in this experiment fed on a Chinese small holding were estimated to have consumed (dry weight) 789 lbs of B1 ration (unbalanced ration) costing $13.38, and 1,011 lbs. of B2 ration (unbalanced) costing $9.38, or a total of 1800 lbs. of food costing $22.76.

At the termination of the experiment these pigs weighed 210 lbs. (52 lbs. each), valued at 12.75 cents per lb., live-weight a total value of $26.77, or an excess of $1 per animal over the cost of food.

The four pigs fed on balanced ration at Serdang consumed 575 lbs. of ration A1 (balanced) and 919 lbs. of ration A2 (balanced), a total of 1,494 lbs. (dry weight), costing $34.58.

At the end of the experiment the four pigs at Serdang weighed 385 lbs., (96 lbs. per pig). Using the same standard market value as for the pigs fed on unbalanced ration (12.75 cents. per lb. live-weight) the total value of these pigs was $49.09, or an excess of $3.63 per animal over cost of food.

While, for the purposes of comparison the value per lb. for the pigs fed at Serdang is calculated to be the same as those fed on a small holding, owing to the firmness and texture of the pork the carcases of the pigs fed at Serdang were valued by Chinese butchers at 2 cents per kati (1 1/3 lb.) higher than those fed on the small holding.

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THE EFFECT OF LALANG GRASS *(IMPERATA ARUNDINACEA)* ON GROWTH OF COCONUT PALMS

By

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Botanist.

The opinion has long been held that strong growth of lalang grass had an adverse effect on the growth of rubber trees and coconut palms, but prior to the experiment here described no comparative examination had been undertaken to measure this effect or to ascertain the cause.

Experiments were commenced in October 1931 at the Central Experiment Station, Serdang, with plots planted in rubber, and at the Coconut Experiment Station, Port Swettenham, with plots planted in rubber and dwarf coconuts.

Three types of cultivation treatment were given in each experiment—(a) lalang retained, (b) lalang removed and leguminous creeping cover (*Centrosema pubescens*) planted, (c) lalang removed and clean weeded. In the lalang plots a clean circle of four feet in diameter was maintained by periodic light cultivation round each palm and the lalang itself was scythed once in 6 months. In other plots the removal of the lalang was accomplished by digging and forking to a depth of six inches.

An important point which was overlooked in the design of the experiments was that the removal of the lalang for the clean weeded and for the cover crop plots introduced the factor of cultivation of these plots and not of the lalang plots. These lalang plots should also have been treated in the same way but without removal of the roots of the lalang which would then have very quickly re-established itself. This is the more important as the land had not been cultivated for a very long time and is, at Port Swettenham, of a particularly stiff clay.

Officers of the Rubber Research Institute have been concerned with the records of the experiments with rubber trees, a summary of which will be published in the Journal of that Institute. This article deals with the experiment planted with dwarf coconut palms at the Coconut Experiment Station, Port Swettenham.

The land in the neighbourhood of the Coconut Experiment Station is flat and low-lying and the soil is a stiff coastal clay with the water table varying around 30 inches from the surface. This area was originally cleared between 20 and 30 years ago, and has been planted with padi, sugar and tapioca, while for the last twelve years it has been allowed to remain under lalang. For a few years during this period the land was used by Sikh cattle owners for two small herds of milk buffaloes.

The experiment with dwarf coconut palms was commenced in January, 1932, and consisted in planting a block of 12 plots of 1/5 acre, with the three treatments replicated four times, with seedlings spaced 11 feet by 11 feet, so that there were approximately 70 young palms per plot. Each plot is surrounded by a three-foot drain.

Coconuts on Clean Weeded Area

Coconuts on Cover Crop Area.

Coconuts in Lalang Area.

Unfortunately two varieties of dwarf coconut palm were planted—red and green —and there was variation in the dates of planting; in addition there has proved to be considerable difference in the fertility of the soil. In consequence, statistical analyses of figures cannot be made, but the results of the experiment are clearly recognisable.

The following is a diagramatic representation of the layout of the experiment:—

B 2 Cover Green	C 2 Clean Red	A 2 Lalang Red Green	B 4 Cover Green	C 4 Clean Red	A 4 Lalang Red
C 1 Clean. Green	A 1 Lalang. Red	B 1 Cover Red. Green	C 3 Clean Green	A 3 Lalang Red	B 3 Cover Red

Plots A1 and B1 are on the site of a former cattle shed and the soil is especially fertile. Plots B3 and A4 were planted much later. Plot A4, too, was affected severely by rat damage, and C1 by dry weather soon after planting.

It is of interest, also, to record in connexion with Plot A1, in lalang, that, in addition to this plot being on part of the old cattle shed site, during 1935 due probably to the fertility of the soil a strong growth of the wild passion fruit creeper and some *Centrosema pubescens* became established, in spite of the lalang, and was tending to suppress and kill out the lalang under the increasing top cover of the palms themselves. These creepers were removed in 1936 and the growth of lalang soon became stronger again, though it is not, even now, as dense in growth as the lalang of the other three plots.

In the very early stages of the experiment the lalang plots, except the one damaged by rats, showed the best growth and it is possible that the grass provided shade which was beneficial in dry spells and may, too, have prevented water-logging of the soil in wet weather. The clean weeded plots certainly suffered, in the early stages, from sun-baking of the soil. The cover crop plots showed progressive improvement in comparison with the other treatments.

There are, as has been indicated, several factors affecting uniformity of the plots and the most practical method of examining the effects of the three treatments is to compare growth measurements for all four plots of each, at succesive dates. Heights of palms are measurements to tip of tallest leaf in crown.

Date.	Treatment.	Averages of heights of palms in feet.				
		Plot 1.	Plot 2.	Plot 3.	Plot 4.	Mean
2.5.33	Lalang ...	5.8	4.1	4.1	2.0	4.0
	Clean ...	2.8	3.7	3.5	3.5	3.4
	Cover ...	4.7	3.3	3.1	3.1	3.5
2.3.34	Lalang ...	9.5	6.3	6.8	3.3	6.5
	Clean ...	5.0	7.1	7.1	6.0	6.3
	Cover ...	8.6	7.3	5.1	7.0	7.0
5.5.34	Lalang ...	10.2	6.9	7.9	4.0	7.2
	Clean ...	6.3	8.6	8.5	6.9	7.6
	Cover ...	10.2	8.4	6.5	8.3	8.3
18.5.38	Lalang ...	18.4	14.9	17.5	16.1	16.7
	Clean ...	19.7	18.0	20.7	17.6	19.0
	Cover ...	21.5	21.5	20.8	20.8	21.2

The following is a full summary of measurements of palms taken in May, 1938:—

Plot No.	Average height of palms in feet.	Average girths @ 12″ in inches.	Average girth @ 36″ in inches.	Average height of stem to axil of lowest leaf, in inches.
A1 ...	18	24	23	43
A2 ...	15	23	22	21
A3 ...	17	24	22	36
A4 ...	16	23	22	19
C1 ...	20	31	24	32
C2 ...	18	24	23	35
C3 ...	21	29	28	46
C4 ...	18	25	23	31
B1 ...	22	26	24	48
B2 ...	21	31	27	46
B3 ...	21	29	24	44
B4 ...	21	33	25	48
Averages				
Lalang (A) ...	17	23	22	31
Clean weeded (C) ...	19	27	24	36
Cover crop (B) ...	21	30	25	47

The yields of fruit have also been recorded. They are important records for coconuts, especially as fruit-production is not so closely correlated with girth and height measurements of stem as these are with yields of latex from rubber trees.

The following are the yields of fruit from January 1936, when the majority of the palms had commenced to bear, up to the end of April, 1938:—

Treatment.	Yields of fruits.				
	Plot 1	Plot 2	Plot 3	Plot 4	Total.
Lalang (A) ...	1255	82	698	8	2043
Clean (C) ...	334	506	502	490	2132
Cover (B) ...	1451	825	1189	674	4144

The total yields from the cover crop plots are obviously very much superior to either of the others. The total yields from lalang and from clean weeded plots appear, at first sight, to be very similar, but further analysis will show a difference.

Lalang plots A1 and A3 commenced at first to yield particularly well, especially A1 in, presumably, manured soil; but during 1937 both plots commenced a steady decline in yield in a manner which it is almost certain will be continued, and a continuation of yield records is expected to show the yields of the lalang plots to be much inferior to those even of the clean weeded plots.

A comparison of the total fruits obtained during the first and second halves of the above period will illustrate the nature of the decline in yields of the lalang plots.

	Jan. 1936-Feb, 1937	March, 1937-April, 1938	Total.
Lalang ...	1323 fruits	720 fruits	2043 fruits
Clean ...	749 „	1383 „	2132 „
Cover ...	1638 „	2506 „	4144 „

The comparatively high total of fruits taken from the lalang plots in 1936-37 is due to the excellent yield in 1936 of fruits from Plot A1, on the site of the cattle shed; but this plot deteriorated rapidly in 1937 after the growth of lalang had been allowed to become stronger.

The poor appearance of palms in the lalang plots is also very notable. There is very little difference in the appearance of the palms in the cover crop and in the clean weeded plots except that the palms in the former are slightly larger and the leaves are a darker green, whilst those in the latter are somewhat thinner in the crown. But there is no difficulty at all in recognising a difference between these palms and those in the lalang plots, which are, with the exception of palms in plot A1, much less well developed, and almost all show yellowing of the leaves.

An examination of the root systems of a number of palms in each of the three treatments revealed the fact that the development of surface feeding roots is much greater in the clean weeded and the cover crop plots than in the lalang plots

In the former, surface roots are found all over the plots to maximum distances from the palms, whilst in the latter, they are limited to the area within the cleaned circles, four feet in diameter, around each palm. This applies only to the surface roots of the palms, for lower-branching roots are fairly well developed in the soil below the main lalang root system, at a depth of about one foot.

The top-soil in the lalang plots is much stiffer than the top-soil of the other treatments, and this may be due, in part, to the different treatment in the initial stage of the experiment. It is by no means dry, even after a month with less than one inch of rainfall, so that excessive transpiration reducing soil moisture cannot be adduced as a cause of the poor development of the palm roots.

The stiff soil seems to be poorly aerated except in the passages formed by the lalang roots, which have not formed a dense system, even close to the surface.

Lalang will not grow in inundated land, nor strongly in heavily shaded land; but it occurs in open land that has been cleared, burned and/or neglected and it may be axiomatic to state that lalang is found well established in uncultivated land of which either the soil temperature was originally so high, or the standard of fertility had by other means been so greatly reduced, or the soil texture is so close, that most other plants are unable to compete successfully.

Soil Analyses.

Top soil and sub-soil samples were taken for analyses by means of augur borings in connexion with the experiments with rubber, but were not taken in the coconut area. The analytical determinations were those of pH (soil acidity), carbon, nitrogen, and conductivity as a possible rough index of total "available" soil nutrients. The figures obtained from these analyses showed large fluctuations and no reliable conclusions can be drawn from them. They show, however, that although the amount of nitrogen in the top soil varied considerably from time to time, the amounts for the lalang, cover crop and clean weeded plots were all very similar at the same times.

Conclusions.

The experiment could have been better designed and would probably have been more informative if treatments had included lalang cultivated and allowed to grow again. lalang frequently scythed, common lawn grass (*Paspalum conjugatum*) and natural growth of small shrubs, as well as the clean weeded, cover crop and untreated lalang plots that were used.

The results, however, may be regarded as having confirmed the widely held opinion that unchecked growth of lalang is injurious to coconut palms. This effect is probably governed in degree by the physical nature of the soil.

The poor development of the coconut palms in the lalang plots is probably due to a limited uptake of nitrates by reason of the restricted development of the surface feeding roots, apparently caused by some inhibiting effect of the lalang, and intensified, possibly, by the stiff close nature of the soil.

It is known that some plants when grown together have a mutually beneficial effect; but there are many more instances of competition between plants for soil nutrients and for light, and those succeed which, in their requirements, and in

habit, are better adapted to their environment; root "antagonism" is one means by which the more vigorously growing plant is able to suppress the weaker.

In the present instance the lalang appears to be much better adapted to existing natural conditions than do the coconut palms; but it has not been determined whether or to what extent the growth of the surface roots of the young coconut palms is inhibited by the purely physical condition of the soil, inadequate aeration, vigour of growth and competition for soil nutrients, or the formation of a toxic substance on the part of the lalang roots. It is possible that all four reasons may have some bearing on the result.

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THE GIANT SNAIL *(ACHATINA FULICA* FER.*)*

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TWO CONTAINERS FOR MIXTURES.

"Meta" fuel, a proprietary compound metaldehyde, when mixed with rice bran has undoubtedly proved very successful in killing snails and slugs; indeed, the results obtained from its use are most spectacular. The meta mixture is, however, apt to prove expensive as it is readily washed away by rain and is said to be poisonous to poultry and some other animals. These disadvantages may be overcome by covering the mixture with tiles, but the writer in his investigations of *Achatina* has found a cigarette tin and a mushroom type of container more satisfactory.

The Cigarette Tin Container. (Fig. I).

The cigarette tin container based on the design of pill-boxes for ant poisons by Cotton and Ellington* consists of an ordinary 50—cigarette tin measuring about 3 inches in height and 2⅝ inches in diameter. The top is divided into eight equal sections (*i.e.* each is just over 1 inch in width) by making cuts from the rim to a depth of about 1⅜ inches. Alternate sections are bent downwards and inwards to provide a smooth surface and the four erect sections are bent slightly outwards to make the lid fit tightly. The tin may be secured to the ground by driving a nail through its base or by driving four sticks placed at equal distances around its base. When the lid is in place the sections are about 1 inch square. The sections should not be larger and the tins should not contain more than 1oz. of mixture, otherwise poultry will be able to reach it. There is a gradual reduction of the mixture owing to small snails and slugs having to be removed from the tins and to larger snails, which crawl up the sides of the tin and stretch their bodies through the sectional holes, having fed upon it. A cigarette tin of the above design, containing only 1 oz. of bran-meta mixture, has been responsible for the death of 41 snails in one night and of 93 snails throughout a period of two months. A bran-meta mixture will, therefore, prove effective throughout a long period, and will require to be replaced only when the receptacle is empty.

The Mushroom Container. (Fig. II).

The cost of the cigarette tin container is negligible, but the mushroom type may be prohibitive for estate work. The type, as illustrated, was made from tin sheeting for 30 cents by a Chinese tin-smith. A reduction would undoubtedly be made for a large order. As illustrated, this type consists of two parts, the container (A) aud mushroom (B). The container is 3½ inches in diameter and

* Cotton, R. R. and Ellington, J. W., "A simple and effective ant trap for household use" *Journal Economic Entomology*, Vol. 23, pp. 463—464.

THE CIGARETTE TIN CONTAINER.

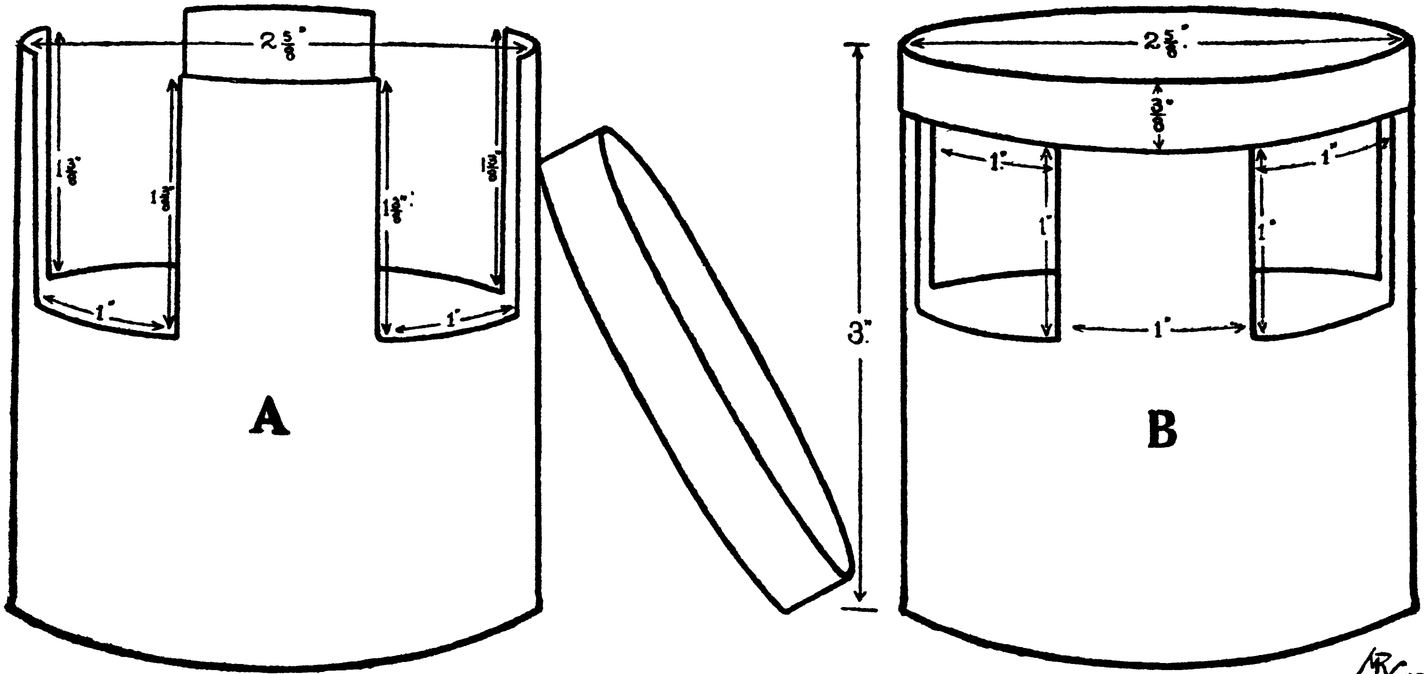

FIGURE I.—A. A Cigarette Tin Illustrating Sections.

B. Assembled for use.

THE MUSHROOM CONTAINER.

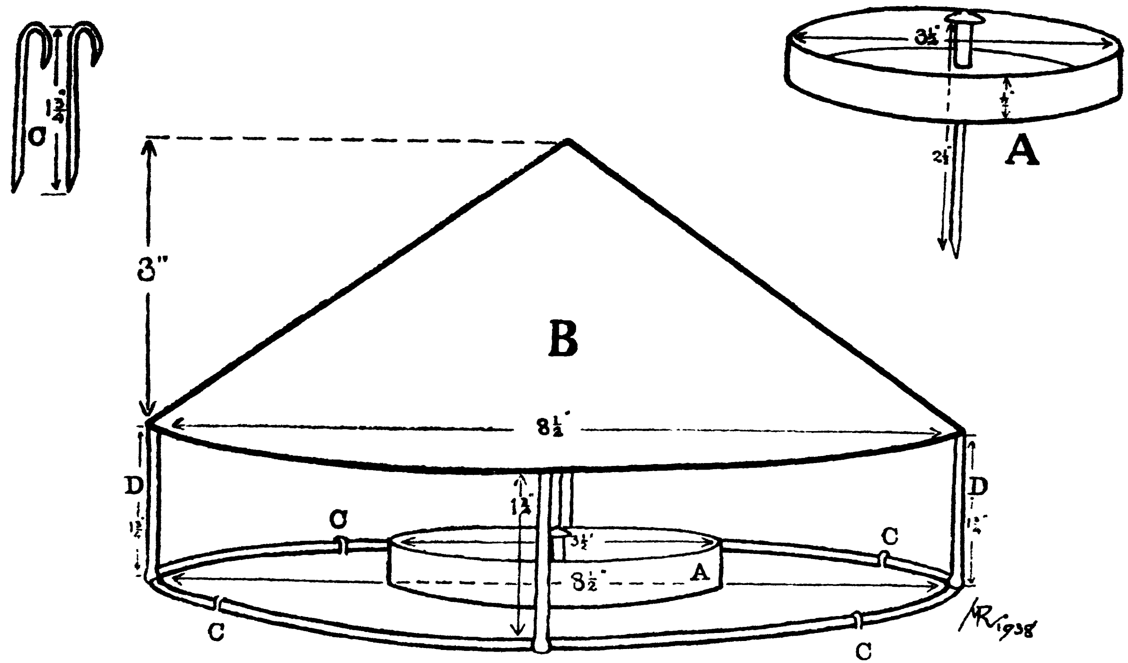

FIGURE II.—A. Container, B. Mushroom, C. Hooks, D. Stays.

$\frac{1}{2}$ inch in height and has at its centre a piece of circular tubing through which a nail is passed to fix it to the ground. This container is designed to contain 1 oz. of bran-meta mixture.

The mushroom part, which is soldered to a wire frame, is placed centrally over the container, the diameter of the mushroom and frame being $8\frac{1}{2}$ inches. The four stays (D) holding the mushroom to the frame are $1\frac{3}{4}$ inches in length, thereby allowing just enough space for the entry of larger snails. The apex of the mushroom from its base is 3 inches and the frame is held to the ground by four hook-like pointed wire rods(C). This type of container has proved successful in catching snails and in protecting and in preventing poultry consuming the mixtures.

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FIFTEENTH MALAYAN EXHIBITION.

The fifteenth annual Malayan Exhibition, organized by the Malayan Agri-Horticultural Association, took place on the Association's premises at Kuala Lumpur on July 30th and 31st and August 1st, 1938.

The organizers were fortunate to enjoy fine weather throughout the period, a fact which was partly responsible for the increased attendance. The official figures show that 30,907 persons paid for admission and 15,772 secured admission on members' and free passes, a total attendance of 46,679 as compared with 35,378 in 1937.

Opening Ceremony.

The Exhibition was opened by His Excellency the Governor and High Commissioner, Sir Shenton Thomas, G.C.M.G., O.B.E., in the presence of a distinguished gathering which included His Highness the Sultan of Selangor and His Highness the Yang di-Pertuan Besar of Negri Sembilan.

In asking His Excellency to open the Exhibition, Mr. F. W. Douglas, President of the Association since its inception, took the opportunity to tender the thanks of the Association to the many willing helpers who made the success of the Exhibition assured. He referred in particular to the value of the Village Industries Section and to the initiative of H.H. the Sultan of Selangor who had organized a stall showing the village handicrafts in his State. The speaker than urged for consideration of the economic position of the villagers by greater control of money-lenders.

In declaring the Exhibition open, His Excellency said:—

> "It is a great pleasure to me to open once again this Exhibition of the Malayan Agri-Horticultural Association, the fifteenth of its kind. In past years I have tried to speak to you on some of the problems with which agriculture in Malaya is confronted, but to-day I propose to depart from that practice, partly because the future is so obscure and partly because I feel that the Exhibition itself deserves more than a few words of mention.
>
> I am glad to say that all the stall space has been taken up. Four important firms exhibit for the first time, and others who were not represented last year have now returned. I am sure this is wise. I am told that last year one firm sold $18,000 worth of goods at this Exhibition.
>
> H.H. the Sultan of Selangor has provided for a stall at his own expense in order that you may be able to see, and to buy, the products of some of the villages of his State.
>
> It is a great pleasure to me to see this further proof of His Highness's enthusiasm for the welfare of his people.
>
> Indeed, village industries are particularly well represented this year and you will find contributions from every State save Perlis and Brunei. You will find also exhibits from all the trade schools, and most interesting they are. An oil crushing machine at work is being shown by the Agricultural Department, and although the Rubber Research Institute are not exhibiting, their own offices are so near that everyone can go and see the work that is being done.

We welcome the appearance of live stock once more after an enforced absence of four years due to the prevalence of foot and mouth disease. There is as usual a health, maternity and child welfare section, an art stall, cinematograph films (including some by amateurs), a fine show of flowers and vegetables, including many from Cameron Highlands, where development is making rapid headway, and an all-Malayan padi competition.

There is another feature which I suggest that you should not overlook. That is a demonstration of top-spinning. It might be thought that this is not a sufficiently adult pastime to be worthy of inclusion in the Exhibition, but I have seen the Malays spinning their tops in Kelantan and I can assure you that it is not child's play.

The products of Malaya, displayed annually here in Kuala Lumpur are, as you know, being brought this year before a large public at the Empire Exhibition at Glasgow. Some photographs of the Malayan section can be seen here to-day and we are grateful to the organizers for the care and ability with which they have represented Malaya in Great Britain.

The Exhibition at Glasgow is enabling many people who have never been to Malaya to form some idea of what this country is like. What they see at Glasgow will undoubtedly be more true to life than the things they read about the East in most novels or see in films. It may be that it will encourage them to visit us.

In the same way our Exhibition in Kuala Lumpur gives a chance to people who have not the opportunity of travelling to see what other parts of this country are like. The Exhibition is really representative of Malaya. It contains much of the best that is to be found in the Malay States, and here one can see in a day what would take many weeks to discover and study in the places from which the exhibits come.

Mr. Douglas has spoken of the need of assistance to the peasant. It is one of the main purposes of this Association to encourage the agriculture of small holders. They have their own problems and many of these are incapable of solution by individuals alone.

It is, therefore, pleasant to know that small agriculturists are combining together in co-operative societies and are by their own efforts building up organisations which will ensure their economic independence.

It has long been the policy of Their Highnesses the Rulers of these States to encourage the planting of padi and food crops and the wisdom of that advice was never more clear than now. One of the obstacles to progress amongst padi planters has been the difficulty of organising a system of finance, which will support the planter during the long period between planting and harvest. It is very encouraging to see that this problem seems to have found satisfactory solution in the formation of Seasonal Co-operative Credit Societies and I hope they will receive widespread support.

Better agriculture depends upon better business and nowhere can a small-holder learn better business than in his Co-operative Society. In the local organisation of the small-holder lies the best hope of the progress of small scale agriculture in the Malay States. I regard the co-operative movement in general as of the very greatest importance to the welfare of this country.

And now before I close I must touch on one other matter. This is the first opportunity that I have had to express publicly my appreciation of the way in which the planters of Malaya as a whole have faced the labour problem which has arisen during the last few months by reason of the cut in the rubber quota.

They have co-operated with the Government in suggesting schemes for unemployment relief, they have arranged the work on their estates so as to throw the fewest possible labourers out of work, and they have refrained from successive reductions of wages as the cut in the quota increased. By so doing, they have made a notable contribution to the peace and happiness of Malaya, and I thank them.

Such consideration for labour is bound to improve the already good relations between employers and employed. The best that I can wish for them is that better times may come soon—sooner perhaps than some expect—so that then they may reap the reward of their wisdom and forbearance.

In declaring this Exhibition open, I thank on your behalf all those who have worked so hard to make it a success, and especially the ladies who are taking part in greater numbers than ever and have vested even the most unpicturesque exhibits with some attractiveness."

Competitive Sections.

All-Malayan Padi Competition.

For the fifth successive year the competition for padi was organized on a Malayan basis. Competitors first exhibit their padi either at District Agricultural Shows or local Padi Competitions. Prize-winners' exhibits then compete in State shows, and the best of these exhibits are then sent to the All-Malayan Padi Competition.

This year the classes were rearranged so that instead of giving a prize for the best padi, the competition was divided into three groups—long, medium and short grain.

The quality of exhibits was little different to that of last year, while the rearrangement of classes greatly facilitated the work of the judges who were called upon to perform the difficult task of selecting the best sample from so many excellent exhibits.

All-Malayan Small-Holders' Rubber Competition.

Exhibits in this competition—which is organized on lines very similar to the padi competition—were confined to rubber smoked sheet. The response this year was greater than in previous years. Five prizes went to Pahang, one to Johore and one to Perak. The superiority of the Pahang samples is not without significance, for in this State rubber dealers have given considerable support by price discrimination, to efforts directed to induce small-holders to produce improved smoked sheet rubber.

Agricultural Section.

The policy of the Committee responsible for this Section has been for the past two years, to insist on no late entries and somewhat ruthlessly to reject all exhibits which, in their opinion, are not up to the standard demanded of an exhibittion organized on a Malayan basis. The result was that fewer exhibits were received thus allowing more space for display, the standard of quality improved, and generally, the Show has gained in dignity. Perhaps the most noticeable

feature was the increase in the number and a wider range of products prepared for market—such as locally bottled or canned fruits, preserves and pickles, tea—both black and green for sale in bulk or in packets—prepared tobacco, cigars, soap and so on. The total exhibits in this section exceeded 3,000 and the close attention which visitors gave to the exhibits was proof that they were interesting and instructively displayed.

Amongst exhibits of vegetables, mention should be made of the attractive display of vegetables from Cameron Highlands.

Horticulture.

The Horticultural Show demanded considerably larger space than last year. The arrangement of the Show was pleasing and enabled individual exhibitors to show their plants and flowers to advantage. Perhaps the most attractive exhibits were the orchids, while the increase in range of English flowers grown in the lowlands was noticeable. A group of flowers from Fraser's Hill demonstrated the possibility of increasing the commercial production of flowers from this easily accessible Station.

Poultry.

The most striking feature of the Poultry Show was the number of pure bred Rhode Island Red cockerels exhibited by small-holders and the care with which they had been prepared for the Show. One pure bred Rhode Island Red in the Kampong Section attracted attention, and when the owner was asked from where he had obtained it he said he had bought one egg from the Department of Agriculture for 25 cents—this prize bird was the result.

The entries were more numerous than in previous years and the judges were satisfied that the general quality of the exhibits continues yearly to show an improvement.

Live Stock.

Owing to foot and mouth disease, it has not been possible to hold a Cattle Show for the past few years. The re-appearance of Sections for Cattle and Goats was therefore particularly welcome this year.

The Cattle Section was divided into 7 classes; 5 of which were for bulls and 2 classes for cows.

Cows were judged on their general conformation combined with their milk yields taken over a period of 24 hours.

The Goat Section consisted of 2 classes.

The exhibits were not numerous in either Section, but considerable interest was evinced in the Sections and there is little doubt that competition will be keener and the exhibits more numerous next year.

Pig Show.

Owing to quarantine restrictions, it was not possible to hold a show of pigs in the Exhibitions of 1936 and 1937. It was difficult after this lapse of years to get in touch with pig breeders, consequently the number of exhibits was less than in former years. This Section also suffered this year from the fact that the Department of Agriculture was unable to send exhibits, as the Government herd is undergoing reconstruction. In all previous years, the exhibits from the Government Farm were the finest in the Show and were the centre of interest. Their animals also formed a basis for the comparison of other exhibits and were of a high educational value.

Apart from this disappointment there were some fine exhibits in the pure bred classes, but the support given to the cross breed classes was not up to the standard of past years, either in number of entries or in quality.

The total number of competing entries was 22 as compared with 35 in 1935.

Cat Show.

As usual the Cat Show was held on the last day of the Exhibition. The entries were not numerous, but the remarkably high standard of the animals exhibited compensated for this numerical deficiency. The splendid specimens of Siamese and Persian cats were a prominent feature of the Section. Buyers of kittens were numerous despite the high prices demanded by their owners.

Arts and Crafts.

Village Industries.

The Village Industries Section has grown enormously and this year in spite of much enlarged accommodation in a specially erected building, the space allotted proved insufficient.

This Section is now divided into two parts, the competitive classes which for a number of years have attracted the best individual examples of certain village crafts from many parts of the country and the State Stalls which exhibit for sale specialist craft products of their State which in many cases have benefited by the assistance and advice of the local branch of the Malay Arts and Crafts Society.

Over 3,000 exhibits were received in the competitive classes from Penang, Province Wellesley, Perak, Selangor, Negri Sembilan, Malacca and Trengganu. Most of the exhibits were for sale and the amount realised—$400—for the benefit of exhibitors, was a record.

The extent to which the competitive part of the section is now overshadowed by State Stalls may be gauged from the fact that the cash sales, exclusive of orders, at the Selangor, Kelantan, Trengganu, Port Dickson and Kedah Stalls and at the Stall of the Sultan Idris Training College, Tanjong Malim, exceeded $5,000. The Stall of the Singapore Malay Union, represented for the first time, also did brisk business.

These State Stalls included for the first time a number of craftsmen and women at work weaving, making silver, pottery, fibre mats, baskets, walking sticks and giving demonstrations of how 'batek' is made and of the new Yuzen process of colour stencilling on silk. It is hoped that this feature, which attracted much interest, can be further developed next year.

The Governor's cup was awarded to the Kelantan Stall for an outstandingly attractive and interesting display.

School Industries.

School industries were well represented and showed the very great attention which is now paid in both boys' and girls' schools to arts and crafts. Many of the most important schools had their own stalls.

A feature of great interest were the separate groups of exhibits staged by the five trade schools of Penang, Kuala Lumpur, Johore, Malacca and Singapore. The articles on exhibition included working models of electrically driven engines, tailoring and carpentry, while craftsmen were seen at work.

A Silver Medal was awarded to the Penang Trade School for the best exhibit in this Section. Sales of furniture from the Malacca and Johore stalls were brisk.

Needlework and Handwork.

The Needlework and Handwork Section, which this year was confined to hand made articles, received a very satisfactory number of entries, about 350 pieces of work being submitted. Mention is made of the large entry of Malay gold embroidery, the high standard of smocking, and the excellence of the coloured embroidery on linen.

Arts and Photography.

The 1938 Arts and Photography exhibition proved the largest on record—439 pictures having been shown as compared with 223, 262 and 272 in the three preceding years.

The standard on the whole was good for amateur work, and that of the photography group, especially among the Chinese, quite exceptionally high. The weakest section was that for the oil-paintings, which, with the exception of two or three exhibitors' work, was poor.

In spite of the large number of good entries, sales were very small, owing undoubtedly to the fact that water colours and photography were too highly priced by their owners.

Departmental Exhibits.

The Department of Agriculture, in addition to staging the All-Malayan Small-Holders' Padi Competition and the Oils and Fats Section, demonstrated in a specially-erected building the use of a hand press for the extraction of palm oil.

The Rubber Research Institute of Malaya organized the All-Malayan Small-Holders' Rubber Competition Visitors were invited to the Institute, which is situated near the Exhibition, to view the premises and the nature of the investigations in hand.

The F.M.S. Railways showed a working model of the interlocked signalling system. Members of the staff explained the working of the system and were available to answer enquiries regarding transport or to book tickets.

The Fisheries Department at a special stall showed, amongst other interesting exhibits, the various kinds of fish, sea corals, and fish traps used locally.

The Medical Department in their permanent building, staged instructional exhibits and demonstrations regarding infant welfare, malarial work and general sanitation.

For the first time the Malay Regiment, stationed at Port Dickson, was represented by a stall, decorated with the regimental colours. N.C.O.'s and men of the Regiment were on duty at the stall distributing literature and giving information about service in the Regiment.

The Trade Section was, as usual, staged in the main building of the Exhibition. The space allotted to the Section was fully occupied by stands.

The Y.W.C A. again provided a rest-room for women which was much appreciated, and a post office provided the usual efficient service.

Entertainments.

A varied programme of entertainments was provided and was enthusiastically supported by visitors. The entertainments included a cycling carnival, Selangor Boy Scouts' Association Display, Malay top spinning matches, Wayang Kulit, a Bangsawan, Film Propaganda, the new amateur Cine Film Competition winning exhibits, "Retreat" beaten at the Stadium by the Drums of the Malay Regiment which drew a large crowd, and on the last evening a very popular anti-aircraft demonstration at the Stadium by B Company Selangor Battalion F.M.S.V.F. the "bombardment" of the village defended by this Company being undertaken by aeroplanes of the Kuala Lumpur Flying Club.

D.H.G.

THE ALL-MALAYAN PADI COMPETITION, 1938.

The All-Malayan Padi Competition was carried through for the fifth consecutive year, the final stage being held in conjunction with the Agriculture Section of the Fifteenth Malayan Exhibition organised by the Malayan Agri-Horticultural Association in Kuala Lumpur on 30th July to 1st August. Judging of the exhibits was completed the day before the opening of the Exhibition.

District and State shows had been held at various centres during the two or three months preceding the Exhibition as shown in the following table:—

	Local or Mukim Padi Competitions.	District Shows.	State Shows.
Penang ...	—	1	—
Kelantan ...	—	5	—
Province Wellesley ...	—	3	1
Perak ...	41	15	1
Selangor ...	10	4	—
Pahang ...	46	5	1
Negri Sembilan ...	9	3	—
Malacca ...	17	3	—
Kelantan ...	—	5	—

The number of exhibits received from each of these States and Settlements for the central competition was as follows:—Penang and Province Wellesley 15 (12), Perak 33 (43), Selangor 18 (17), Pahang 13 (14), Negri Sembilan 15 (12), Malacca 12 (11), Kelantan 3 (3), total 109 (112). The figures in brackets are for 1937.

The general standard of padi was fairly high but not so high as for last year. This may be accounted for by the fact that the season, particularly in the north of the Peninsula, has not been too good, owing to drought at nursery time. This especially affected the varieties of long maturation period which had already been sown when the dry spell set in and which it was not possible to transplant until they had been an exceptionally long time in nursery beds.

Penang and Province Wellesley were most seriously affected by this drought and in consequence exhibits from this area were particularly disappointing.

Exhibits from Selangor, with its scattered and/or young padi areas, were, as usual, below average in quality but showed, if anything, a slight improvement.

Pahang, Negri Sembilan and Malacca were all very even in standard with varied ranges of good exhibits of Siam, Radin and Seraup types.

Kelantan sent in three exhibits of very good appearance but which were not quite up to prize-winning standard.

Perak as usual had the largest number of entries and were awarded the challenge shield on account of the even standard and high quality of a number of Radin exhibits from Kuala Kangsar District. The expected numbers and quality of Seraup exhibits from Krian were lacking, largely owing to the difficult season which favoured shorter term varieties.

The method of awarding prizes was altered. First and second prizes were given in four different classes as follows:—Long grain types, (Siam, Sakepol etc), Medium grain types (Seraup, Sabatil etc.), Medium grain types (Radin Kuning, Reyong, etc.) and Short grain types (Milek, Serendah etc.).

Prizes were awarded as follows:—

Siam type	—	1st prize for Siam 29 from Rembia, Malacca, and 2nd prize for Siam 29 from Johol, Negri Sembilan.
Seraup type	—	Both prizes for local Seraup from Labu, Negri Sembilan.
Medium type	—	1st. prize for Radin Kuning (R.2) from Kuala Kangsar, and 2nd prize for Radin Kuning from Kuala Lipis, Pahang.
Short type	—	1st prize for Radin Merah (R.4) from Kuala Kangsar, and 2nd prize for Milek Kuning 3 from Bentong, Pahang.

Judging was made on purity and cleanness of sample, degree and uniformity of ripeness, and condition and uniformity of grain. Type of grain was also considered; approved types included those of wide popularity for yields and quality of rice, with well filled grain and of reasonable size.

R.B.J.

Received for publication 1st. September, 1938.

Reviews.

Annual Report of the Drainage and Irrigation Department of the Malay States and the Straits Settlements for the year 1937.

By A. G. Robinson, B.Sc. (Eng.), M. Inst. C.E., Director, Drainage and Irrigation, Malay States. F.M.S. Government Printing Press, Kuala Lumpur, 157 pp. 61 illustrations, 32 maps and plans. Price $1 or 2s. 4d.

The 1936 Report of the Drainage and Irrigation Department was reviewed at some length in *The Malayan Agricultural Journal* last year, when the reviewer commended it as a comprehensive survey of the progress made to-date in drainage and irrigation in Malaya. The present report is equally comprehensive, and carries the account of progress to the end of 1937.

The Report is of particular interest to agriculturists and miners, but certain aspects of the work of the Department must also appeal to municipal bodies, and the Medical profession, especially Chapters X and XI, which deal respectively with conservancy of rivers, and silting of rivers from soil erosion.

In this place we are particularly concerned with the agricultural aspect of the work of the Department. The work of the Drainage and Irrigation Department is, of course, well known to officers of the Department of Agriculture, and the Field Officers of the latter Department are in constant touch and collaboration with the former Department.

The task of improving land for agricultural purposes has made steady progress during the six years that the Drainage and Irrigation Department has been in existence. The work appears to fall under two heads—improving existing agricultural areas, and making available new areas for agricultural purposes. In the former category may be included the numerous schemes, both large and small, for improving irrigation and drainage, while in the latter are included the more ambitious schemes of opening up extensive tracts of land especially for padi cultivation. In the former, results are apparent at an early date after completion of the work, and as an instance of such success may be mentioned the draining and bunding in the Sabak Bernam peninsula of Selangor which has resulted in a spectacular improvement of the considerable area of coconut palms in this area.

The bringing to fruition of new schemes of irrigation demands patience as well as the skill of the engineer. Considerable progress has been made in opening up new areas for agricultural purposes, and it is evident from this Report that the work of the engineer is reasonably in advance of colonization, for it is noticed that in connexion with four of the principal schemes, some 15,000 acres are ready for cultivation, but have not yet been alienated to cultivators.

The duties of the Department under review are not concerned solely with the special service of inaugurating schemes of drainage and irrigation, but include the equally important duty of maintaining such works in an efficient state. Mr. Robinson appreciates the paramount importance of this aspect of his problem for he writes:—

> "Nor does the work of the department end with the completion of a drainage and irrigation scheme. The department must see that the economic results from the schemes are brought to fruition. This is a long and laborious process necessitating on the part of the officer concerned, a knowledge of the people, their language and their customs, and initiative and continuity of effort are essential."

Malayan Rubber Statistics Handbook 1938.

Compiled by the Department of Statistics, S.S. and F.M.S. Published at the Government Printing Office, Singapore. To be purchased direct from the Government Printing Office, Singapore, or from Kelly and Walsh Ltd., Raffles Place, Singapore, 118 pp. 1 graph. Price $1.50 (Straits currency) or 3s. 6d.

This annual compilation of statistics concerning the Malayan rubber producing industry gives, in 88 Tables, all the available statistics of Malayan acreage, production, imports, exports and consumption of rubber up to the end of the year 1937.

The book is divided into nine Sections. The first—and most important—Section, in 20 Tables deals with the subject from a Malayan point of view, and includes tables of total planted area, tappable area, budgrafting, tappable area not tapped, nationality of ownership, local consumption, foreign imports and exports, domestic exports, stocks and average Singapore prices since 1933. Subsequent sections are concerned with the rubber statistics of the Straits Settlements, Federated Malay States, and each of the Unfederated Malay States.

Obviously, the book is a work of reference, but an essential publication for those who wish to be placed in possession of authoritative statistics on this subject.

Report of the Working of Rubber Regulation in Malaya during 1937.

Published by the Federated Malay States Press, Kuala Lumpur, as Paper No. 36 of 1938. 35 pp. Price $1 post free in Malaya.

The position of Malaya in the International Rubber Regulation Agreement, and the working of the scheme in this country during 1937 are detailed in this publication, which is supported by statistical information for the year under review. It is understood that only a limited number of copies of this Report are available for sale.

Departmental.

FROM THE DISTRICTS.

The Weather.

The intensely dry period which had been general in all parts of the country came to an end in August.

In Kedah the weather was cold and very heavy rainfall occurred. The average for all districts was over 10 inches. There were frequent violent westerly gales along the coast. In Penang and Province Wellesley similar conditions prevailed and flooding occurred in some parts.

At Bendang Kroh in South Perak a violent gale blew down III houses.

In other parts of the country such extreme wet weather has not been the rule. In Perak and in the northern parts of Pahang and Kelantan the weather remained dry until the second half of the month when thunderstorms and showers occurred bring the rainfall for the month up to normal. In the south and eastern part of Pahang the weather remained rather dry until the end of the month.

Selangor experienced frequent heavy showers but water supplies in some of the northern districts are still reported to be short. The precipitation in Negri Sembilan was higher than normal.

In Johore the second half of the month was wet and cool, but in only a few places was the rainfall in excess of the average. Ample rain fell in Singapore.

Remarks on Crops.

Rubber.—The price of rubber showed a steady appreciation throughout the month, closing at an average price of $34 per picul for good quality smoked sheet. Export rights also increased in value to $25 per picul. There has been an increase in tapping in some areas, though this is not so apparent in padi planting districts where work in the rice fields is still in progress.

The interest in new planting rights had, at the beginning of the month, slackened somewhat and not more than 75 or 80 cents per unit was being paid. When it became known that Government would entertain applications for State land for planting rubber, there was an immediate renewal of interest, and the price hardened to $1.20. Many applications for State land are being dealt with in all parts; and applications are also being received for the conversion to rubber of conditions attaching to land originally alienated for other crops.

The grading scheme which has recently been inaugurated in Perak is apparently already having a good effect, and dealers in Krian report that small holders are producing better sheet.

Padi.—In the west coast areas planting is well advanced. The rain enabled good progress to be made though flooding in Penang and the Province did some damage to nurseries. In Pahang, where dry weather had previously held up planting operations, rains enabled a start to be made in all districts.

The wholesale price of padi in Kedah and Province Wellesley increased appreciably. At the Government Rice Mill in Krian $2.10 per picul is still being paid: very little business, however, is now being done.

Rats do not yet appear to be numerous and the number killed in organized hunts has been small. It is probable that the prolonged dry weather and subsequent heavy rain caused a large reduction of the rat population.

Coconuts.—In Province Wellesley large crops of nuts have been harvested. Yields, however, are now commencing to diminish.

The price of copra generally tended to depreciate somewhat.

Derris.—For some months demand has been slack in this market and prices low. In Singapore there is a steady demand for good quality derris of a high rotenone content to meet American requirements which favour this type of root. There has been little demand previously for the Kinta type root (of which the rotenone content is low) and local Perak dealers have dropped out of the business; growers, therefore, being unable to sell their crops, experienced some hardship. There is now, however, a small demand for this root in Sumatra and elsewhere and dealers are again buying fair quantities.

Tobacco.—The advent of the wet weather has seen an increase in the planting of this crop. In Kedah and Perak tobacco has long been an important minor crop and large new areas are now being opened up. Several hundred acres are annually planted in Kelantan. The growing of tobacco on anything but a very small scale is quite a recent departure in Malacca. Chinese growers are now taking it up and considerable areas are being developed. This year in Malacca stem borers, which are probably the worst pest of tobacco in other parts of the country, have made their appearance as a serious pest for the first time.

The locally grown leaf is usually sold, either cured or in a fresh state, to dealers who manufacture it into cheroots, often mixing it with imported leaf of a better quality. Growers themselves manufacture and sell a certain quantity of shag tobacco.

Sakai Reserve Plots.

A certain amount of success is attending the settlement of Sakai on the land at Anak Ayer Denak and Langkap in Perak. The small-holders plant wet and dry padi, maize and vegetables. Frequent supervision is, however, necessary as otherwise the plots soon become neglected. Most of these Sakai, who are of the Batin people, work well with instruction; but they are of a somewhat poor type and left to themselves they show no initiative and soon lose interest.

DEPARTMENTAL NOTES.

Term Commences at the School of Agriculture, Malaya.

The second term of the current session commenced on 18th August and will end on 21st October. This comparatively short term can hardly be avoided as experience has proved the inadvisability of keeping students at the School during the Mohammedan fasting month. A corresponding longer period will therefore be allotted to the third term which will extend from the end of November until the middle of April next.

There are 60 boys in training at present, of whom 43 are taking the Two Years' and 17 the One Years' (Vernacular) Course. Eighteen students (5 Malays, 11 Chinese, 1 Indian and 1 Dutch Burgher) will be leaving the School next April on completion of the two years' course of training.

Three or four Old Boys (Chinese) have not yet found suitable employment and the Principal would be glad to hear of any vacancies on estates for which they might be considered.

Visit of the Director, Rubber Research Institute of Malaya, to Brunei and Labuan.

The Agricultural Officer, Brunei and Labuan, reports that the Director, Rubber Research Institute of Malaya, visited Brunei between 10th and 15th August and Labuan on 16th August.

During his visit to Brunei samples of rubber sheet were brought in by small-holders for his inspection and great interest displayed on his comments. It is understood that the Director was impressed with the quality of some of the small-holders' smoked rubber, which he considered was of first quality.

In Labuan, the Director inspected many small holdings and attended a meeting of Malay small-holders at the Agricultural Station. Numerous questions regarding rubber growing and production were asked by the small-holders, and a demonstration of sheet rubber coagulation was given by the Asiatic Rubber Inspector.

Leave.

Mr. R. G. H. Wilshaw, Chemist (Soils), has been granted 274 days leave from 13th August 1938 to 13th May, 1939, both days inclusive.

Mr. H. T. Pagden, Entomologist, has been granted 215 days leave from 13th August 1938 to 15th March 1939 both days inclusive.

Mr. H. N. Sands, Agricultural Officer, returned from leave on 11th August, 1938.

Mr. J. N. Milsum, State Agricultural Officer, Perak, has been granted 288 days' leave from 31st August, 1938 to 14th June 1939 inclusive.

FERTILIZER PRICES, AUGUST, 1938.

The following are the prices at the end of August, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40 00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

Statistical.

MARKET PRICES.

August, 1938.

Major Crops.

Rubber:—The price sagged a little during the first week, but thereafter showed a small but steady improvement. The lowest Singapore dealers' buying price for No. 1 X Rubber Smoked Sheet loose was 25⅝ cents per lb. on 5th, and the highest 27½ cents on 25th and 26th, the average price for the month being 26.56 cents per lb., as compared with 25.11 cents in August. The London average price was 7.85 pence per lb., and the New York price 16.01 cents gold per lb., as compared with 7.44 pence. and 15.21 cents gold per lb. in the previous month.

Prices paid for small-holders' rubber at three centres during August are shown in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, August, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan			Kuala Kangsar, Perak		Batu Pahat, Johore.				
	4	18	25	10	17	3	10	17	24	31
Smoked Sheet	31.88	32.60	—	32.30	33.00	—	—	30.50	33.09	—
Unsmoked Sheet	31.00	—	32.00	—	—	29.70	28.50	29.50	24.82	31.09
Scrap	No purchases									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases at Kuala Kangsar on 3rd, 24th and 31st or at Kuala Pilah on 11th August.

Palm Oil:—Prices eased somewhat from those ruling in the previous month. The average weekly quotations in July were:—palm oil £14-11-0 per ton, kernels £8-17-6 per ton; prices for August are shown in the following Table.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
August 5	£ 14. 10. 0	£ 8. 10. 0
„ 12	14. 0. 0	8. 2. 6
„ 19	13. 15. 0	8. 10. 0
„ 26	14 5. 0	8. 7. 6
Average August	£ 14. 2. 6	£ 8. 7. 6

Copra:—Prices in Singapore declined throughout the month from $3.65 per picul for sun-dried at the beginning of the month to $3.35 at the end of the month. The average price of this grade for August was $3.43 per picul as compared with $3.66 in the previous month. The mixed grade showed a corresponding decline, being quoted at 35 cents per picul less than sun-dried, the average price was $3.08 as compared with $3.32 in July.

Copra cake was quoted throughout the month at $2.10 per picul.

Rice:—The average Singapore wholesale market prices of rice per picul in July were as follows:—Siam No. 2 ordinary $4.39, Rangoon No. 1 $3.92, Saigon No. 1 $4.02, as compared with $4.25, $3.95, $3.87 respectively in June and $4.08, $3.55 and $3.72 respectively in July 1937.

The average retail prices in cents per gantang remain unchanged at Singapore 28, Penang 32 and Malacca 28.

The average declared trade value per picul of imports during July was $3.91 as compared with $3.88 in June 1938, and $3.78 in July 1937.

Padi.—In the main rice-growing districts the price of padi was between $8 and $9 per 100 gantangs, with an upward tendency. In districts more remote from centres of production the price varied from $8 to $14 per gantang.

Pineapples. Canned pineapples have been quoted throughout August at the following prices per case of 48 tins of 1½ lbs. each:—G.A.Q. Cubes $2.70, Sliced Flat $2.65, Sliced Tall $2.80; Golden Quality $2.90, $2.85 and $2.95 respectively.

The first season has now ended and all factories in Johore have closed down. Prices of fruit improved slightly in Singapore being 90 cents to $1.60 per 100 fruits at factory. Elsewhere prices continue low, in north Johore from $3 to $2 for first quality, $2.00 to $1.50 second quality and $1.20 to $1 third quality. In Selangor the price was from 40 to 70 cents per 100 fruits and in Negri Sembilan from $2 to $3 per 100 fruits.

Beverages.

Tea:—Four consignments comprising 384 packages of upland tea and 5 consignments comprising 360 packages of lowland tea were sold on the London market during August. The upland tea sold at prices between 1s. 1¾d. and 1s. 1¼d per lb., the average being 1s. 1. 44d. per lb., and the lowland between 1s. 0½d. to 11d. per lb., the average quotation being 11.9d. per lb.

According to the Tea Brokers' Association of London Market Reports for August, the average London price per lb. realized during the month for consignments of tea from other countries were as follows:—Ceylon 1s. 2.78d., Java 1s. 0.32d., Indian Northern 1s. 3.61d., Indian Southern 1s. 0.88d., Sumatra 10.99d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* 30th August 1938, of the Ceylon Brokers' Association are as follows, in rupee cents per lb. High Grown Teas 85 cents, Medium Grown Teas 73 cents, Low Grown Tea 61 cents.

Coffee:—Palembang coffee in Singapore ranged throughout the month at $9 to $10 per picul, the price within this range depending upon quality. Sourabaya coffee was quoted throughout August at $11 to $12 per picul.

The price of Liberian coffee was $14.50 per picul and Robusta $6.00 per picul throughout the month. Excelsa rose 50 cents to $9.50, but dropped again to $9.00 per picul, the average price being $9.10 per picul.

Spices.

Arecanuts:—The range of Singapore market quotations for August were as follows per picul:—Splits $8.22 to $5.10; Red Whole $7.25 to $6.10; Sliced $9.37 to 8.19.

The averages of Singapore Chamber of Commerce quotations per picul were:—Best $7.62, Medium $7.01, Mixed $6.50 as compared with $7.32, $6.88 and $6.20 in July.

Pepper:—Prices were easier and the market neglected. Average Singapore prices per picul in August were:—Black $8.12½, White $13.06, Muntok $13.31, as compared with $8.22, $13.65 and $13.90 respectively in July.

Nutmegs:—Prices tended to decline during August; the average price for the month for both 110's and 80's was $30.25 per picul, as compared with $28.60 in July.

Mace:—Siouw mace was quoted throughout August at $80 per picul as compared with an average price of $80.40 in July. Amboina was quoted during August at $62 per picul as compared with $63.20 per picul in July.

Cloves:—Nominal prices were again quoted throughout the month at $40 per picul in Singapore for both Zanzibar and Amboina cloves.

Cardamoms:—The latest available price for green cardamoms as given in The Ceylon Chamber of Commerce Weekly Report for 29th August, 1938, is from Rs. 1.00 to Rs. 1.11 per lb.

Miscellaneous.

Derris:—There was no demand in Singapore for derris sold on ether extract basis; prices for first grade rotenone varieties, however, were well maintained owing

to lack of supplies. Root sold on basis of ether extract was quoted at $14 per picul, and on the basis of rotenone content from $18 to $20 per picul.

A firm of insecticide manufacturers in New York, writing at the end of July, state that the season is coming to an end and any further purchases of derris for shipment from Singapore cannot arrive until after the agricultural season; therefore only desultory buying is likely until October/November. Shippers are offering Malayan root guaranteed to contain 5 per cent. rotenone at 6¾d. c.i.f. New York, and offerings from Java are on the same level, *i.e.* 14 cents c.i.f. New York. Cubé root is also slightly weaker, being freely offered at 9 cents c.i.f. New York, for root with 5 to 6 per cent. rotenone. Our correspondent adds:—

"The trade here anticipates that derris root will before next season approach even more closely the price of cubé root from Brazil as only when this comes about can derris root obtain an equal share of the U.S. trade."

Gambier:—Block gambier dropped from $7.50 to $7.25 at the end of August, the average price for the month being $7.44 per picul as compared with $7.50 in July. Cube No. 1 was quoted throughout August at $15 per picul as compared with an average price of $15.10 in July.

Tapioca:—Tapioca was quoted throughout August at the following prices per picul:—Flake Fair $4.10, Seed Pearl $3.90, Medium Pearl $4.50.

Sago:—Pearl, Small, Fair continued to be quoted at $3.75 per picul. Flour, Sarawak Fair appreciated in price—from $1.97½ at the beginning of August to $2.15 per picul at the end of the month—the average price for August being $2.04 per picul as compared with $2.05 in July.

Tobacco:—In the more important centres of production, uncured leaf sold for $4 to $5 per picul. The general average of prices of cured leaf was per picul:— 1st quality $25 to $50, 2nd quality $20 to $40, 3rd quality $15 to $30. With the advent of rains, new areas have been planted in several districts. Prices in Kelantan remain very high and the local factory demand exceeds local supply. Prices per picul of cured leaf were:—Grade I $100 to $160, Grade II $80 to $128, Grade III $40 to $112.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm Oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note:— The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London W.C.2.

GENERAL RICE SUMMARY*

July, 1938.

Malaya.—The imports of foreign rice during July were 63,171 tons† and exports 12,774 tons, net imports being 50,397 tons as compared with 53,176 tons in 1937.¶ Net imports for the first seven months of 1938 amounted to 352,667 tons as compared with 317,520 tons in 1937.

On the July imports, 45 per cent. were consigned to Singapore, 17 per cent. to Penang, 6 per cent. to Malacca, 23 per cent. to the Federated Malay States and 9 per cent. to the Unfederated Malay States. The July gross foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 42,143 (66.7); Burma 19,206 (30.4), French Indo-China 925 (1.5), other countries 897 (1.4). Net imports in July 1938 by countries of origin, were as follows (in tons): Siam 31,622, Burma 17,408, French Indo-China 570, elsewhere 797.

For the first seven months of 1938, total imports of rice into Malaya amounted to 461,539 tons, of which 63.6 per cent. was Siam rice, and 32.5 per cent. Burma rice.

Of the exports during July 1938, 75 per cent. were consigned to the Netherlands Indies, and 25 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 10,521 (82.3), Burma 1,798 (14.1), French Indo-China 355 (2.8), parboiled 39 (0.3), Malayan production 61 (0.5).

India and Burma.—Foreign exports for the first half year 1938 were 137,000 tons, as compared with 587,000 tons in 1937, a decrease of 76.7 per cent. Of these exports, 3.7 (4.4) per cent. were to the United Kingdom, 5.8 (6.5) per cent. to the Continent of Europe, 38.0 (27.2) per cent. to Ceylon, 5.1 (23.7) per cent. to the Straits Settlements and the Far East, and 47.4 (38.2) per cent. to other countries. The percentages in brackets are for 1937.

Burma's exports for the period 1st January to 27th July, 1938, amounted to 2,191,180 tons, as compared with 2,203,003 tons in 1937, a decrease of 0.5 per cent. Of the 1938 exports, 42.0 (46.9) per cent. were to India, 9.4 (8.8) per cent. to the United Kingdom, 8.6 (9.4) per cent. to the Continent of Europe, 11.1 (10.6) per cent. to Ceylon, 13.6 (11.7) per cent. to the Straits Settlements and the Far East, and 15.3 (12.6) per cent. to other countries. The figures in brackets are for 1937.

Average July price in rupee cents per 100 baskets of 75 lbs. each at Rangoon were 219 for Big Mills Specials, and 234 for Small Mills Specials.

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* Abridged from the Rice Summary for July 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Siam.—Exports of rice and rice products from Bangkok during May were 132,969 tons, as compared with 64,141 tons in 1937. For the first five months of 1938, exports amounted to 698,490 tons, as compared with 440,833 tons in 1937.

Japan.—The latest information available was published in the General Rice Summary for June 1938.

French Indo-China.—Entries of padi into Cholon during the first seven months of 1938 were 771,255 tons, as compared with 987,852 tons in 1937, a decrease of 21.9 per cent. Exports of rice during the same period were 796,673 tons as compared with 902,385 tons in 1937, a decrease of 11.7 per cent.

The Saigon rice report of June 1938, received from His Majesty's Consul at Saigon, states:—"Prices of rice and padi showed a slight but continual increase. This tendency was seen in rice prices throughout the month despite small demand in the first two weeks from France and Hong Kong. The opening, mid-month and closing figures were $3.37 per picul, $3.38 per picul and $3.43 per picul respectively." Padi prices per picul on the same dates were as follows: $2.14, $2.17 and $2.22 respectively. (Prices are in S.S. currency and a picul of 133⅓ lbs).

Netherlands Indies.—The latest information available was published in the General Rice Summary for May, 1938.

Ceylon.—Imports of rice for the first seven months of 1938 amounted to 327,813 tons, as compared with 312,144 tons in 1937, an increase of 5 per cent. Of these imports 17.4 (17.1) per cent. were from British India, 71.3 (69.5) per cent. from Burma, 0.3 (0.1) per cent. from the Straits Settlements, and 11.0 (11.3) per cent. from other countries. The percentages are for 1937.

Europe and America.—Shipments from the East to Europe for the period 1st January to 7th July, 1938, totalled 794,375 tons, as compared with 740,688 tons in 1937, an increase of 7.2 per cent. Of these shipments, 45.5 (46.9) per cent. were from Burma, 44.3 (35.5) per cent. from Saigon, 8.6 (5.3) per cent. from Siam and 1.6 (2.3) per cent. from Bengal. The figures in brackets are the corresponding percentages in 1937.

Shipments for the Levant from 1st. January to 27th June, 1938, were 24,262 tons, as compared with 10,265 tons in 1937, an increase of 136.4 per cent.

Shipments for Cuba, West Indies and America from 1st January to 24th June, 1938, were 111,858 tons, as compared with 139,446 tons in 1937, a decrease of 19.8 per cent.

[*Commerce Reports* for July 9, 1938 states: "Exports of rice were banned by the Shanghai Chinese Rice Guild on June 25, because of low local stocks, and retail prices now have reached the municipal price limit of 14 yuan per 150 pounds." *Ed. M.A.J.*].

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
July	2,546.5	2,134.2	450.8	311.0
Total ...	14,417.1	11,128.1	2,596.0	1,871.0
Total January to July, 1937 ...	13,026.3	10,184.8	2,309.0	1,655.3
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 31st July, 1938 were palm oil 2,117 tons, palm kernels 738 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST JULY, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of tappable rubber not tapped: Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Otherwise than under rotational systems: Percentage of (7) to (2)	Under rotational systems: Acreage	Under rotational systems: Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Area of Tappable Rubber never been tapped: Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,319	19,601	45.2	932	2.2	14,080	32.5	8,706	20.1	426	1.0	23,718	54.8
Malacca ...	121,829	58,590	48.1	3,735	3.1	27,784	22.8	31,720	26.0	2,077	1.7	63,239	51.9
Penang ...	2,488	1,213	48.8	nil	nil	1,215	48.8	60	2.4	18	0.7	1,275	51.2
Singapore ...	32,415	16,421	50.7	4,332	13.4	6,401	19.7	5,261	16.2	163	0.5	15,994	49.3
Total S.S. ...	200,051	95,825	47.9	8,999	4.5	49,480	24.7	45,747	22.9	2,684	1.3	104,226	52.1
F. M. S.—													
Perak ...	286,435	160,358	56.0	7,117	2.5	65,507	22.9	53,453	18.6	6,594	2.3	126,077	44.0
Selangor ...	323,990	196,848	60.8	6,454	2.0	56,182	17.3	64,506	19.9	6,542	2.0	127,142	39.2
Negri Sembilan ...	255,047	141,910	55.6	7,430	2.9	55,109	21.6	50,598	19.9	7,506	2.9	113,137	44.4
Pahang ...	86,362	49,252	57.0	3,164	3.7	22,091	25.6	11,855	13.7	5,943	6.9	37,110	43.0
Total F.M.S. ...	951,834	548,368	57.6	24,165	2.5	198,889	20.9	180,412	19.0	26,585	2.8	403,466	42.4
U. M. S.—													
Johore ...	476,295	284,923	59.8	12,721	2.7	107,788	22.6	70,863	14.9	32,628	6.9	191,372	40.2
Kedah ...	196,667	115,743	58.9	7,252	3.7	31,661	16.1	42,011	21.3	6,517	3.3	80,924	41.1
Kelantan ...	31,188	20,204	64.8	252	0.8	6,276	20.1	4,455	14.3	1,899	6.1	10,984	35.2
Trengganu (b) ...	4,817	3,182	66.1	nil	nil	74	1.5	1,561	32.4	74	1.5	1,635	33.9
Perlis (c) ...	1,371	667	48.7	224	16.3	417	30.4	63	4.6	86	6.3	704	51.3
Brunei ...	5,692	2,954	51.9	nil	nil	1,895	33.3	843	14.8	301	5.3	2,738	48.1
Total U.M.S. ...	716,030	427,673	59.7	20,450	2.9	148,111	20.7	119,796	16.7	41,505	5.8	288,357	40.3
Total MALAYA ...	1,867,915	1,071,866	57.4	53,614	2.9	396,480	21.2	345,955	18.5	70,774	3.8	796,049	42.6

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.
(c) Rendered quarterly.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JULY, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 8	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1938	during the month	Jan. to July 1938	during the month: Foreign	during the month: From Malay States & Labuan	January to July 1938: Foreign	January to July 1938: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to July 1938: Foreign	January to July 1938: Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,944	15,125	10,506	79,307	4,183	37,833	Nil	Nil	Nil	Nil	12,073	664	87,834	25,340	...	10,260	16,743	18	110
Johore ...	...	5,005	6,152	4,622	36,409	2,018	21,966	Nil	39	Nil	144	2,535	4,355	21,683	35,524	...	4,043	6,903	...	...
Kedah ...	...	325	3,836	2,538	19,704	951	6,412	Nil	Nil	Nil	Nil	1,417	1,595	12,547	13,060	...	345	4,293	...	...
Perlis ...	...	20	26	12	94	20	159	Nil	Nil	Nil	Nil	Nil	22	Nil	222	...	31	25	...	...
Kelantan ...	...	798	390	358	2,549	491	4,492	Nil	Nil	Nil	Nil	263	611	1,910	5,044	...	728	445	...	...
Trengganu ...	...	55	50	237	1,857	119	929	Nil	Nil	Nil	Nil	Nil	356	Nil	2,786	...	55	50	...	...
Brunei ...	...	Nil	54	46	326	53	482	...	...	...	...	...	79	...	809	...	17	57	...	...
Total Malay States	...	16,147	25,633	18,329	140,246	7,835	72,273	Nil	39	Nil	144	16,288	7,682	123,974	82,785	...	15,479	28,516	18	110
S. SETTLEMENTS :—																				
Malacca ...	...	2,400	1,655	947	7,923	52	3,860	Nil		Nil		2,122		17,048		...	2,299	1,664	...	...
Province Wellesley	...	2,454	738	378	2,955	154	1,611	Nil		Nil		7,137		52,901		...	3,081	735	...	...
Penang ...	2,754	5,751	7	18	130	26	596	3,289	10,093	16,630	87,490		Nil		Nil	1,149	5,660	15	...	...
Singapore ...	4,558	31,675	207	123	1,047	27	409	15,377		80,397		18,142		130,215		4,716	34,011	245	24	173
Labuan ...	...	49	Nil	Nil	Nil	3	84	47		328		Nil		Nil		...	47	Nil	...	...
Total Straits Settlements ...	7,312	42,329	2,607	1,466	12,055	262	6,560	18,713	10,093	97,355	87,490	27,401	Nil	200,164	Nil	5,865	45,098	2,659	24	173
Total Malaya ...	7,312	58,476	28,240	19,795	152,301	8,097	78,833	18,713	10,132	97,355	87,634	43,689	7,682	324,138	82,785	5,865	60,577	31,175	42	283

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	9,067	31,141	5,495	5,248	3,284	145
WET RUBBER	1,193	870	165	196	759	200
TOTAL ...	10,260	34,011	5,660	5,444	4,043	345

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. to July 1938 31
Singapore ...	28,111	213,078
Penang ...	11,254	78,675
Port Swettenham.	4,129	30,881
Malacca ...	195	1,504
MALAYA ...	43,689	324,138

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. to July 1938 34
Malay States ...	23,933	206,338
Straits Settlements	1,928	17,666
MALAYA ...	25,861	224,004

Notes :—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable
6. The above, with certain omissions, is the Report published by the Acting Registrar-General of Statistics, S.S and F.M.S., at Singapore on 23rd August, 1938

METEOROLOGICAL SUMMARY, MALAYA, JULY, 1938.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes									Number of days.							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet	Total.		Most in a day. Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.6	71.5	82.1	97	68	87	74	84.1	85.1	1.12	28.4	0.67	6	5				208.55	6.73	55
Bukit Jeram, Selangor ...	89.9	72.7	81.3	92	69	87	75	86.0	87.6	2.06	52.3	1.16	9	5	2		1	251.00	8.10	66
Sitiawan, Perak ...	91.4	72.2	81.8	94	68	87	75	84.7	85.4	0.76	19.3	0.28	9	5		1		236.10	7.62	62
Ipoh Aerodrome, Perak ...	91.2	71.7	81.5	94	68	85	74	83.7	84.7	2.40	51.0	0.82	9	7	4			209.15	6.75	54
Temerloh, Pahang ...	91.4	71.7	81.5	95	69	82	75	85.8	87.1	4.96	126.0	1.64	11	8	1	8		215.45	6.95	57
Kuala Lipis, Pahang ...	91.3	71.2	81.3	96	68	85	74	85.3	85.9	4.14	105.2	1.54	10	6	3	15		195.00	6.29	51
Kuala Pahang, Pahang ...	87.4	74.0	80.7	93	72	81	77	86.9	88.2	3.67	93.2	1.06	9	8	5		2	253.00	8.16	66
Kallang Aerodrome, S'pore ...	86.4	76.5	81.5	90	71	80	69	83.3	84.3	6.21	157.7	1.62	12	9	5		1	235.15	7.59	62
Bayan Lepas Aerodrome Penang ...	87.9	74.1	81.0	90	68	80	76	84.5	85.2	4.80	121.9	1.94	14	11	1			240.75	7.77	63
Malacca Town, Malacca ...	86.8	74.0	80.4	90	71	83	82	85.9	86.5	7.71	195.8	3.74	13	11	8		3	240.75	7.77	64
Kluang, Johore ...	88.9	70.7	79.8	92	68	79	74	82.0	82.9	2.31	58.7	0.87	9	7	1	5		207.70	6.70	55
Mersing, Johore ...	87.4	71.2	79.3	90	69	81	74	82.6	82.9	4.70	119.4	1.44	13	12	2		4	220.45	7.11	58
Alor Star, Kedah ...	88.5	73.8	81.1	91	70	80	76	84.9	85.9	2.96	75.2	1.47	11	6				246.75	7.96	64
Kota Bahru, Kelantan ...	89.7	73.1	81.4	92	71	86	76	84.7	85.5	5.14	130.6	1.21	11	7	4	1		241.35	7.79	63
Kuala Trengganu, Trengganu	88.3	72.5	80.4	92	69	83	76	83.5	85.5	4.02	102.7	1.11	13	7	3	1		218.20	7.04	57
Labuan ...	87.3	76.3	81.8	91	72	83	80	86.0	87.1	10.27	260.9	2.38	17	16	3		2	231.35	7.46	60
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.4	62.6	69.0	78	67	71	64	72.1	72.7	3.78	96.0	1.59	13	10	5	5	2	212.90	6.87	56
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.3	54.3	63.8	77	47	70	60	70.1	70.6	4.75	120.7	0.95	13	12	1			172.90	5.58	45
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.2	59.3	66.3	77	57	69	61			4.76	120.9	1.16	13	12				185.10	5.97	48

Compiled from Returns supplied by the Meteorological Branch, Malaya.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JULY, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealers	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: Jan. to July 1938	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: Jan. to July 1938	Imports during the month: Foreign	Imports during the month: From Malay States & Labuan	Imports January to July 1938: Foreign	Imports January to July 1938: From Malay States & Labuan	Exports including re-exports, during the month: Foreign	Exports including re-exports, during the month: Local	Exports including re-exports, January to July 1938: Foreign	Exports including re-exports, January to July 1938: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over	Consumption 3: during the month	Consumption 3: Jan. to July 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,944	15,125	10,506	79,307	4,183	37,833	Nil	Nil	Nil	Nil	12,073	664	87,834	25,340	...	10,260	16,743	18	110
Johore ...	...	5,005	6,152	4,622	36,409	2,018	21,966	Nil	39	Nil	144	2,535	4,355	21,683	35,524	...	4,043	6,903	...	...
Kedah ...	...	325	3,836	2,538	19,704	951	6,412	Nil	Nil	Nil	Nil	1,417	1,595	12,547	13,060	...	345	4,293	...	...
Perlis ...	...	20	26	12	94	20	159	Nil	Nil	Nil	Nil	Nil	22	Nil	222	...	31	25	...	...
Kelantan ...	...	798	390	358	2,549	491	4,492	Nil	Nil	Nil	Nil	263	611	1,910	5,044	...	728	445	...	...
Trengganu ...	...	55	50	237	1,857	119	929	Nil	Nil	Nil	Nil	Nil	356	Nil	2,786	...	55	50	...	...
Brunei ...	...	Nil	54	46	326	53	482	...	...	...	...	...	79	...	809	...	17	57	...	...
Total Malay States	...	16,147	25,633	18,329	140,246	7,835	72,273	Nil	39	Nil	144	16,288	7,682	123,974	82,785	...	15,479	28,516	18	110
S. SETTLEMENTS :—																				
Malacca ...	...	2,400	1,655	947	7,923	52	3,860	Nil	10,093	Nil	87,490	2,122	Nil	17,048	Nil	...	2,299	1,664	...	...
Province Wellesley	...	2,454	738	378	2,955	154	1,611	Nil		Nil		7,137		52,901		...	3,081	735	...	...
Penang ...	2,754	5,751	7	18	130	26	596	3,289		16,630						1,149	5,660	15	...	...
Singapore ...	4,558	31,675	207	123	1,047	27	409	15,377		80,397		18,142		130,215		4,716	34,011	245	24	173
Labuan ...	...	49	Nil	Nil	Nil	3	84	47		328		Nil		Nil		...	47	Nil	...	...
Total Straits Settlements ...	7,312	42,329	2,607	1,466	12,055	262	6,560	18,713	10,093	97,355	87,490	27,401	Nil	200,164	Nil	5,865	45,098	2,659	24	173
Total Malaya ...	7,312	58,476	28,240	19,795	152,301	8,097	78,833	18,713	10,132	97,355	87,634	43,689	7,682	324,138	82,785	5,865	60,577	31,175	42	283

TABLE II
DEALERS' STOCKS IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	9,067	31,141	5,495	5,248	3,284	145
WET RUBBER	1,193	870	165	196	759	200
TOTAL ...	10,260	34,011	5,660	5,444	4,043	345

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to July 1938
29	30	31
Singapore ...	28,111	213,078
Penang ...	11,254	78,675
Port Swettenham.	4,129	30,881
Malacca ...	195	1,504
MALAYA ...	43,689	324,138

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to July 1938
32	33	34
Malay States ...	23,933	206,338
Straits Settlements	1,928	17,666
MALAYA ...	25,861	224,004

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month + Consumption, i.e., Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) − (2) − (3) − (4) − (5) − (9) − (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable
6. The above, with certain omissions, is the Report published by the Acting Registrar-General of Statistics, S.S and F.M.S., at Singapore on 23rd August, 1938

METEOROLOGICAL SUMMARY, MALAYA, JULY, 1938.

Locality.	Air Temperature in degrees Fahrenheit — Means of — A. Max.	B. Min.	Mean of A and B	Absolute Extremes — Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature — At 1 foot	At 4 feet	Rainfall — Total		Most in a day. Amt.	Number of days — Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine — Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.6	71.5	82.1	97	68	87	74	84.1	85.1	1.12	28.4	0.67	6	5				208.55	6.73	55
Bukit Jeram, Selangor ...	89.9	72.7	81.3	92	69	87	75	86.0	87.6	2.06	52.3	1.16	9	5	2		1	251.00	8.10	66
Sitiawan, Perak ...	91.4	72.2	81.8	94	68	87	75	84.7	85.4	0.76	19.3	0.28	9	5		1		236.10	7.62	62
Ipoh Aerodrome, Perak ...	91.2	71.7	81.5	94	68	85	74	83.7	84.7	2.40	51.0	0.82	9	7	4			209.15	6.75	54
Temerloh, Pahang ...	91.4	71.7	81.5	95	69	82	75	85.8	87.1	4.96	126.0	1.64	11	8	1	8		215.45	6.95	57
Kuala Lipis, Pahang ...	91.3	71.2	81.3	96	68	85	74	85.3	85.9	4.14	105.2	1.54	10	6	3	15		195.00	6.29	51
Kuala Pahang, Pahang ...	87.4	74.0	80.7	93	72	81	77	86.9	88.2	3.67	93.2	1.06	9	8	5		2	253.00	8.16	66
Kallang Aerodrome, S'pore ...	86.4	76.5	81.5	90	71	80	69	83.3	84.3	6.21	157.7	1.62	12	9	5		1	235.15	7.59	62
Bayan Lepas Aerodrome Penang ...	87.9	74.1	81.0	90	68	80	76	84.5	85.2	4.80	121.9	1.94	14	11	1			240.75	7.77	63
Malacca Town, Malacca ...	86.8	74.0	80.4	90	71	83	82	85.9	86.5	7.71	195.8	3.74	13	11	8		3	240.75	7.77	64
Kluang, Johore ...	88.9	70.7	79.8	92	68	79	74	82.0	82.9	2.31	58.7	0.87	9	7	1	5		207.70	6.70	55
Mersing, Johore ...	87.4	71.2	79.3	90	69	81	74	82.6	82.9	4.70	119.4	1.44	13	12	2		4	220.45	7.11	58
Alor Star, Kedah ...	88.5	73.8	81.1	91	70	80	76	84.9	85.9	2.96	75.2	1.47	11	6				246.75	7.96	64
Kota Bahru, Kelantan ...	89.7	73.1	81.4	92	71	86	76	84.7	85.5	5.14	130.6	1.21	11	7	4	1		241.35	7.79	63
Kuala Trengganu, Trengganu	88.3	72.5	80.4	92	69	83	76	83.5	85.5	4.02	102.7	1.11	13	7	3	1		218.20	7.04	57
Labuan ...	87.3	76.3	81.8	91	72	83	80	86.0	87.1	10.27	260.9	2.38	17	16	3		2	231.35	7.46	60
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.4	62.6	69.0	78	67	71	64	72.1	72.7	3.78	96.0	1.59	13	10	5	5	2	212.90	6.87	56
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.3	54.3	63.8	77	47	70	60	70.1	70.6	4.75	120.7	0.95	13	12	1			172.90	5.58	45
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	73.2	59.3	66.3	77	57	•69	61			4.76	120.9	1.16	13	12				185.10	5.97	48

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

OCTOBER, 1938

EDITORIAL.

Soil Erosion.

Soil erosion in Malaya has not been the serious problem that it has assumed in certain other countries; nevertheless, the damage from this cause has been considerable, and in many cases permanent, while the danger to health which so frequently accompanies erosion, by providing breeding places for malaria-carrying mosquitoes, has been ever present.

Mr. J. R. P. Soper, in an article entitled "Soil Erosion on Penang Hill" outlines the damage done to this beauty spot by soil erosion, and summarizes recent legislative action designed to prevent further erosion in this area.

The efforts being made at Penang are of more than local interest, for in the adoption of measures with a similar object in other parts of the country doubtless advantage will be taken of the experience gained by the Penang authorities.

Plant Hormones.

Research carried out over a number of years by the scientists of many countries established the fact that plant hormones are connected with the growth of roots. This basic fact led to the discovery of several synthetic hormones, some of which are now sold under proprietary names.

The investigations on plant hormones and their substitutes has attracted considerable attention, one might almost say that there has been a wave of optimism as to the virtues of these substances and of their value in agriculture. While we wish in no way to minimise the value of this advance in agricultural practice and are convinced that the application of synthetic hormones will become an established factor in plant propagation, we consider that caution is necessary before accepting the use of these substances in the economic production of plants. It is the considered opinion of many practical horticulturists and agriculturists in the United Kingdom that experiment is necessary on a small scale with any particular crop as a preliminary to their systematic employment.

At our request Dr. T. W. Brown contributes a concise statement of the present knowledge of plant hormones and their substitutes. His article should prove a valuable guide to those who wish to apply knowledge on this subject to Malayan agriculture.

Sugar and Alcohol from Nipah.

Mr. V. M. Hinchy, late Distillery Manager of the now defunct Nipah Distilleries of Malaya Ltd., favours us with an original article on the relation between frond transpiration and yield of sap in the nipah palm which we publish in this number.

The author shows that the daily variation in flow of sap when the flowering spathe of the palm is tapped is directly related to humidity, being greater when the weather is dull and the humidity high than during periods of bright sunshine, when the humidity is low.

He omits, however, to provide evidence that a greater total quantity of sugar is obtained with the increased quantity of sap on dull days. The investigations of Eaton and Dennett published in this Journal about fifteen years ago showed that the sugar content of the sap varies considerably, but they also omitted to correlate volume of daily sap with sugar content of sap.

Mr. Hinchy makes the interesting suggestion that the provisions of suitable shade trees on a nipah plantation would probably be effective in reducing transpiration and therefore in maintaining optimum sap flow.

The author has recently published in *The International Sugar Journal* an article on "The Commercial Production of Sugar from the Nipah Palm" which we reprint on another page. The present articles, with those which have appeared in *The Malayan Agricultural Journal* during the past years therefore give a complete account of the experimental work and commercial exploitation of the palm in Malaya.

The reader may well question our further publicity on this subject in view of the fact that the commercial venture has collapsed. We maintain, however, that the value of this palm as a potential source of sugar and especially power alcohol remains unimpared by the failure of the pioneer effort to commercialize the nipah products. Under estate conditions the palm is capable of producing over an unknown period of years an annual output of about 1,000 to 1,500 gallons of power alcohol per acre, and it requires but little imagination to visualize in time when this readily available source of fuel will once more claim public attention.

Mr. O. T. Faulkner, C.M.G., B.A.

It has been common knowledge locally for some weeks that Mr. O. T. Faulkner, C.M.G., Director of Agriculture, Straits Settlements and Adviser on Agriculture, Malay States, has been selected to fill the important post of Principal of the Imperial College of Tropical Agriculture, Trinidad, and by the time these lines appear in print the transfer will be a *fait accompli*, for Mr. Faulkner sailed from Malaya on 23rd. September to take up the duties of his new appointment.

Mr. Faulkner has filled the post of head of the Department of Agriculture, S.S. and F.M.S., for barely two years. He has guided the Department with wisdom and foresight and his influence on Malayan agriculture will long survive his departure from this country.

We wish Mr. and Mrs Faulkner farewell and will greatly miss them both, in Mr. Faulkner's official capacity and in the social atmosphere which they created.

Original Articles.

SOIL EROSION ON PENANG HILL

BY
J. R. P. SOPER,
Agricultural Officer, Province Wellesley and Penang.

Introduction.

The erosion of soil from the slopes of Penang Hill has for several years been a source of misgiving to many. In the first place streams have been silting up, thereby causing difficulties in irrigating and draining the padi land through which they flow on the final stretch of their journey to the sea. Secondly, the clearing of forest and scrub, besides leading to erosion, also increases the breeding places of anopheline mosquitoes. Thirdly, soil wealth in the form of the fertile top layers is being lavishly wasted by foolish methods of cultviation. And fourthly, the beauty of the island is being impaired. As an attempt to check these menaces the "Hill Lands Ordinance" has now been passed by the Straits Settlements Legislative Council, the methods of cultivating the various crops have been studied, and machinery for implementing the Ordinance with as little annoyance as possible to landowners has been set in motion.

Legislation.

Since the terms of the "Hill Lands Ordinance" do not seem to be generally known at present, it may be as well to describe its main features. The Collector of Land Revenue, by notification in the Government Gazette, may declare any land to be "hill land." Once this has been done the owner or occupier may not plant any short term crops whatsoever (bananas and pineapples are included specifically as short term), nor may he interfere in any way with any vegetation except with a permit from the Collector of Land Revenue. Such permits will only be issued for the cultivation of permanent crops, and will specify approved anti-erosion measures. Any further planting of short term crops on gazetted land will therefore be illegal, and once the present crops are harvested, the squatters will have to move, or be moved, elsewhere. It will be seen that very wide and drastic powers have been acquired to deal with an urgent situation: the application of them in practice will be watched with interest.

Land Tenure.

Most of the land is held under old East India Company Grants which impose no conditions. It is now almost entirely in the hands of Chinese and Chettiars, the majority of whom are business men in Georgetown; they rarely have time to visit their properties except during week-ends, so that most of the agricultural work is in the hands of mandors or agents and squatters. It is hoped that landowners will take advantage of the Ayer Itam Farm School to which they can send

their sons who will subsequently be able to manage the estates on sounder principles than at present. The squatters are increasing in number with alarming rapidity; some of them have been on the hill for years practising "shifting cultivation" of short term crops, others are now moving up as the young coconuts under which they previously planted tapioca come into bearing, and there has also been a big recent movement from land acquired by the War Office: furthermore, one war refugee from China has already been met, and there may be others.

Climate.

The average annual rainfall for Penang Hill is 128.05 inches of which 41 per cent. falls during the period September, October, November and 21 per cent. during March, April, May. During the former period in particular, erosion on a large scale may be expected unless very careful precautions are taken.

Soil.

The soil on most parts of the Hill is derived from granite weathered *in situ*. It contains a high percentage of coarse quartz which renders it open and friable: it is consequently very easily eroded when exposed, but if suitably covered it can absorb very heavy falls of rain.

Flora.

The natural flora of the Hill is now only to be found in the jungle comprising the forest reserves and water catchment areas. Parts of these areas grow only a few trees but are covered with a very dense growth of bracken which is also frequently found in rubber and abandoned agricultural land. The latter, however, more often reverts to lalang and Straits rhododendron mixed with Chinese bamboos left by squatters: through this thick growth sapling trees begin to appear after two or three years.

By far the most extensive crop is rubber; after this in a rough order of importance come fruit trees, mainly mangosteen and durian, cloves, vegetables, pineapples, tapioca, bananas, nutmegs, coconuts, tobacco, arecanuts, ginger and flowers. A survey of the areas under each crop is being undertaken to form a basis for the implementation of the Ordinance.

Individual Crops.

(a) Rubber.—

The quality of this crop varies widely: the worst is found on bracken land where either the bracken eventually kills the trees or if the bracken is eradicated, erosion is so serious before other covers can gain a hold that the trees are extremely poor and have most of their roots out of the soil. There are also many poor holdings infested with lalang and other natural covers of an undesirable nature. After these come holdings which have been continuously clean-weeded and those which have been planted on old clove or nutmeg stone-faced terraces: the former are mostly boulder strewn and heavily eroded, on the latter the terraces have generally not

been maintained, and the appearance of both is somewhat similar. At the other end of the scale there are some fine stands of trees now being allowed to revert to beneficial natural covers: an area of this nature on a European estate is probably as good as any seedling rubber in Malaya.

Terracing of a sort is practised on most holdings, even if the terraces are only tappers' paths, but in the majority of cases they are much too narrow and, not being horizontal, they serve as drainage and erosion channels. Where the volume of water becomes too great for the narrow terrace it overflows and starts a gully.

The aims of the cultivation permits to be issued under the Ordinance are to encourage good natural covers by selective weeding, to establish artificial covers where necessary, and to eradicate lalang. The latter has been successfully accomplished on one estate by the use of Assam forks on the contour strip method: a strip 6 to 10 feet wide is slashed and the material is spread evenly over the strip below thereby forming a cover against erosion; the lalang roots are then forked out and put to dry on the top of the leaves; the next strip up hill is then treated in the same way. Lalang grass is also tackled by the "chipping" method. It is probable that most holdings infested with bracken will have to be allowed to revert to natural conditions unless a particularly strong growing cover can be found to swamp it; the use of Eupatorium for this purpose was considered, but as it has not yet reached Penang it was considered inadvisable to introduce such a noxius weed intentionally.

(b) Fruit. –

Durian.—From the erosion standpoint this is the most satisfactory crop now grown on the Hill because there is a local supersitition to the effect that a cultivated durian tree will not bear fruit: consequently the only treatment is an annual slashing just before harvest to prevent the fruit being lost in the undergrowth. The trees thrive on fair to good soil up to 1,200 feet, but above this level and also on the poorer soil types premature die-back takes place. It would probably be a difficult crop to establish on eroded land which has been under short term crops for some time unless heavy manuring were undertaken; growth of young trees under similar conditions at Bukit Lima Kongsi in Province Wellesley has been very slow. There is, however, scope for extended planting of the crop in some areas.

Mangosteen.—This is a very popular crop: a few trees are found near almost every house, and small plantations exist in many places. The trees are generally planted on old stone terraces or on heavily eroded land. They are seldom cultivated except when lalang is hoed, and they yield a very variable crop.

Rambutan.—There are very few rambutan orchards on the Hill except at the lowest elevations. Clean weeding is the general rule with each tree on an earth-faced terrace, so erosion is usually serious. More enlightened growers are now adopting a system of ring-weeding: as the trees become larger the weeded circle gradually develops into an earth terrace, but the intervening spaces and banks are kept under a thick natural cover of grasses and herbs. Heavy manuring is necessary before remunerative crops can be produced.

Chempedak.—This crop is managed in the same way as durians.

Guavas.—Occasional patches of guavas are met with: they generally occur near squatters' houses, are unterraced, clean-weeded and give rise to serious erosion.

In future fruit trees will have to be grown with natural slashed covers or on terraces with stone or grass faced intervals.

(c) Cloves and Nutmegs.—

These two crops are taken together because they are cultivated in the same way. During the early part of the last century they formed the main export crops of Penang Island. They were grown on well-made wide terraces which were generally faced with stone, and must have covered two or three thousand acres by 1850.

In 1866, however, the nutmegs were almost annihilated by disease, and most of the plantations were abandoned until the rubber boom started; a few were put down to fruit, while here and there the original cultivation struggled on. Shortly after this disaster, the Zanzibar clove plantations began to make themselves felt on the world market and cultivation in Penang slowly dwindled.

These crops are always grown on terraces: sometimes each tree has its own, but more often they are grown in single rows on contour terraces varying from about 6 to 12 feet in width: the vertical interval between terraces varies from 3 to 10 feet. The usual practice is to clean-weed the whole holding, weathered soil from the terrace banks (if not stone-faced) being scraped down and worked in round the trees with manure; this latter practice in conjunction with erosion has gone on to such an extent that the roots of the trees on the terrace above are now in many cases exposed. As a rule the terraces are fairly horizontal but the backs of the terraces are used as drains for taking off surplus rainfall and where the outlets converge serious gully formation has already occurred.

Cultivation permits for these crops will aim at establishing natural or sown herbage on the terrace intervals, particularly on the top edges, and also at growing strips of cover across the terraces between the trees so as to check the flow of water along the back drains. With a decreasing amount of water flowing into the gullies it is hoped that natural vegetation will gradually block them.

Both crops require constant heavy manuring; prawn dust is generally used for this purpose, and a large tree may be given as much as 25 pounds per year; this quantity would cost about 60 cents in the plain, and must then be carried up to the plantations, most of which are at about the 1,000 feet level. Both trees are attacked by two or three species of twig and branch borers which may cause severe die-back: nutmegs also suffer from a fungus disease which brings about premature splitting and dropping of the fruit.

Holdings are usually small, and are worked by the owner living on the spot: he generally has a few acres of rubber in addition. Most holdings are heavily mortgaged, and in some cases foreclosures have been applied.

(d) Vegetables.—

Terraced vegetable gardens are mainly found concentrated on the hills around Ayer Itam where there is a wholesale market. No slope is too steep for the squatter who plants them; a steep slope merely means narrower terraces with deeper drops

between them (in the most extreme case observed the respective measurements were roughly 5 feet and 15 feet). Water is led to the topmost terrace from the nearest stream or spring by means of split arecanut trunks: tanks, frequently lined with cement, are constructed on each level, the overflow from one being led off to drop into the next. With a continuous flow from tank to tank and by arranging the pipes so that the jets fall into the centre of the tanks, mosquito larvae cannot breed, but breeding places are often caused by leaks in the conduits between stream and garden. Matted bracken roots, if present, are cut into bricks which are used to hold in the outside edges of the terraces.

On these terraces, constructed with a great deal of labour, are grown crops such as green celery, green peas, french beans and tomatoes which do not flourish in the plains: in addition garlic, mustard, long beans and cabbage are frequently found. The chief cultural difficulty is organic manure. No road runs nearby, the only livestock kept is poultry, and the task of carrying such bulky manures as cowdung up to 1,000 or 1,500 feet cannot be undertaken. The manufacture of compost would necessitate slashing nearby land, and exposing it to erosion. As a result most manure is applied in liquid form and is made by soaking prawn dust or soya bean cake in water for a week before application. Urine mixed with wood ash is generally used when making up new beds and night soil is presumably not thrown away. In spite of this, the soil in these gardens seldom attains a rich colour, and generally presents a "raw" appearance; fertility drops off considerably in the course of a few years and the area is then given a rest under natural covers for two or three years.

Vegetables, of course, come under the heading of short term crops, but it has not been definitely decided to gazette all market gardens as "hill land." It is possible that maximum drops and minimum breadths for terraces will be laid down. The erosion problem is very similar to that in the clove holdings. Loss of soil occurs to a certain extent through falls of earth from the vertical terrace banks, none of which are stone-faced, but more seriously from scour along the back drains which almost invariably have outlets into the same gully. As beds are generally raised leaving a definite drain at the back of the terraces, experiments are to be undertaken during the next rainy season using sections of tree boughs about 4 inches in diameter with a V cut in the centre to form blocks at frequent intervals across the drains; they should hold up the silt and check the water flow, at the same time allowing a certain amount of water through the Vs. It would be quite impossible to persuade the local squatter to grow grass or a cover in his drains.

(e) Pineapples.—

Although there is no pineapple canning factory in this part of Malaya there is a considerable demand for the fruit in the towns. The Georgetown supply comes almost entirely from squatters on the hills, particularly from the Batu Gantong and Relau districts. Conditions under which this cultivation first started are not known; nowadays an area of secondary "belukar" or bush on soil too poor for vegetables is chosen. The cover, consisting mostly of Straits rhododendron, is cut back and burnt

and the land is hoed into terraces 2 to 3 feet wide and not necessarily horizontal; the vertical interval depends upon the slope. The top soil and ashes are brought to the back of the terraces where the suckers are planted 2 to 3 feet apart. Rigorous clean weeding combined with scraping the terrace intervals is practised, with the result that after 12 to 18 months the plants are on the outer edge of the terrace instead of at the back; in this position they tend to hold up the soil for a time, but when after about 3 years they are hanging on by a few remaining roots, the area is abandoned for several years.

Erosion under these conditions is considerable; heavy rain beats on the terrace intervals, carries the eroded soil along behind the plants and forms small gullies in all weak spots. Furthermore, terraces are arranged in blocks between which deep gullies develop. As pineapple supplies can be obtained in Georgetown from some of the flat land in Province Wellesley, it is proposed to prohibit their further cultivation on Penang Hill after allowing one year for present crops to be harvested.

(f) Tapioca.—

This crop is being cultivated at an alarmingly increasing rate on the hills above Glugor, probably by squatters who have been turned off coconut estates. No attempts are made at terracing for tapioca; scrub, bush or jungle is cut and burnt, the land is hoed once, and cuttings are planted. Weeding is done regularly. Under such circumstances erosion cannot fail to be disastrous. Further cultivation will be prohibited.

(g) Bananas.—

Cultivation of bananas is not extensive, but parts of Batu Gantong have been planted with the crop for 15 to 20 years. Legislation or not, it will be impossible to continue for more than another 5 years because by that time what is left of the soil will have gone. Already in places there is nothing left but expanses of rock. The suckers are originally planted on unprotected terraces which are scrupulously clean-weeded. As time goes on small boulders are uncovered by erosion, and these are used to hold up for a while what is left of the soil. There is no case for allowing such cultivation to continue, but in rare cases where they are grown on stone terraces, no harm is done.

(h) Coconuts.—

There can be no doubt that the coconut does not flourish under hill conditions; nevertheless there are large numbers of palms both in small blocks and also scattered among rubber and fruit trees throughout the hill area. The one thing to be said in their favour is that they are generally surrounded by a ring of stones and boulders, inside which manure, either wood ash or prawn dust, is applied. Yields are negligible. Future cultivation is to be discouraged, and in many cases owners are being persuaded to cut out inter-planted palms so as to give the other crop more space to develop. One of the worst cases of erosion on the Hill was seen in a coconut estate at Paya Terubong where clean weeding is being practised with no terracing precautions, indeed it seemed as though old stone terraces had actually been broken down by the labourers.

(i) Tobacco.—
Cultivation is on the same lines as for vegetables; the area is small but satisfactory crops are harvested.

(j) Arecanuts.—
Apart from a large block on Brown Estates, the arecanut is grown as a sole crop on a negligible scale. Natural covers or terraces with covered banks will be stipulated in cultivation permits.

(k) Ginger.—
This is another minor crop, but important from the erosion standpoint because it is planted by much the same methods as pineapples and generally on very steep land. The terraces are even narrower than those used for pineapples.

(l) Flowers.—
Terraced rose gardens are quite common on a small scale, but erosion precautions are seldom taken. The crop is reported to be sufficiently remunerative to justify insistance on stone-faced terraces. Hydrangeas and dahlias are also grown in rotation in vegetable gardens near the hill railway; good returns are said to be obtained.

Conclusion.

As soon as the survey is completed, the first step in implementing the Hill Lands Ordinance will be an endeavour to remove all planters of the most dangerous crops, that is tapioca, pineapples, bananas and ginger, and to concentrate on prohibiting the cultivation of these crops in the future. The other most serious crop is rubber; in this case very valuable work has already been done by the Chinese Asiatic Rubber Instructor in dissuading growers from their allegiance to clean weeding and in demonstrating the advantages of the "forestry" method of management; this work will have to be followed up closely by the inspection staff. When these objectives have been attained, it will be time to consider the position of the remaining crops. In the meantime, with the exception of durians in a few cases, no alternatives to the short term crops can be suggested, but any propositions for planting permanent crops on the land will be carefully considered, and any approved schemes will receive constant watching and advice from the Department of Agriculture.

Summary.

Recent legislation to prevent erosion on Penang Hill is explained.

Conditions under which individual crops are grown are described with special reference to the erosion factor, and the methods by which it is hoped the latter may be countered are outlined.

Received for publication 16th August, 1938.

THE VALUE OF PLANT HORMONES OR THEIR SUBSTITUTES IN PLANT PROPAGATION

By
T. W. Brown,
Agriculturist.

The word "hormone" has long been used by animal physiologists to describe substances produced in one part of an organism and transferred to another part there to exercise specific effects on cells or tissues. They are of the nature of chemical messengers and although only produced in small quantities they have a marked influence on the correlation and differentiation of the organism. It is now known that similar substances exist in plants and to describe them the plant physiologist has made use of the terminology employed by the animal physiologist, although occasionally the prefix Phyto—is added to denote plant origin.

History.

The history of the discovery of hormones in plants dates back some sixty years and arose from investigations connected with the effects of light and gravity on the tips of the shoot and root respectively. With regard to the shoot it was shown that the bending of a seedling stem when subjected to lateral illumination was the result of a stimulus conveyed from the light perceptive tip of the shoot to a lower portion of the stem causing the latter to bend.

In the same way it was demonstrated that the tip of the root alone is gravitationally sensitive and that some influence is transmitted back to the adjoining parts resulting in their downward curvature. Nearly forty years later, carefully conducted experiments gave conclusive proof that the stimulus transmitted from the tip of a shoot to a lower portion of the stem was a material substance formed and secreted by the tip only, and at once the analogy with hormones of the animal kingdom became evident. It was shown also that growth of the stem is dependent upon an uninterrupted supply of this material substance to the growing region below the tip, and the growth promoting nature of the hormone was thus recognised. Since these discoveries were made, a large body of workers in many parts of the world have been investigating the occurrence, properties and functions of hormones in plants, and in consequence a considerable amount of information on the subject has accumulated.

From the horticultural point of view, the most interesting of these researches concern the effects of hormones on the growth of roots. Ten years ago it was demonstrated that an Acalypha cutting without leaves and buds formed few or no roots, but that a cutting with leaves and buds rooted profusely. It was subsequently established that this effect was due to a root-forming hormone produced in the buds and leaves. The occurrence of this hormone in plant tissues appears to be widespread. It has been found in rice polishings, wheat germ oils, cotyledons, pollen of many species, as well as in buds and leaves. Other experiments indicated

that the hormone is not specific since, for example, plants of tea, croton and papaya form mutually reacting root forming substances. It was also discovered that a root growth promoting substance existed in matter of animal origin particularly urine, and incidentally this is probably a contributory cause of the accelerated growth observed when stable manure is used as compared to the equivalent chemical fertilizers.

At this stage the chemical isolation and identification of the hormone was successfully accomplished. It was found to be an organic acid which could be readily synthesised in the laboratory.

Synthetic Hormones.

A number of synthetic substances chemically related to the root forming hormone were tested and found to be similarly active, and the advent of this knowledge marked the beginning of a number of experiments designed to test the effect of these substances on the root formation of cuttings. Among the most active of these substances are indole-butyric, indole-propionic, phenyl-acetic, beta-indole-acetic, and alpha-naphthalene-acetic acids, all of which are now commonly employed by investigators.

Factors Influencing Root Formation in Cultures.

For a proper appreciation of the rôle of synthetic substances it is necessary to bear in mind that the production of roots by cuttings, as in other biological phenomena, is the result of the operation of a number of independent factors and that only the optimum combination of these factors will be effective in inducing root formation. The factors known to exert an influence are either environmental or intrinsic to the plant material.

Of the environmental factors the constitution, acidity and temperature of the rooting medium are all of importance. Sand gives good results with many species although the practical propagator knows that some plants will strike better in other media, as for instance a mixture of sand and peat. A neutral medium is usually employed but in one instance—carnation—acidity produced by sulphuric acid had a beneficial effect although equivalent acidity induced by the addition of acetic acid had a detrimental effect. As regards temperature, experimental evidence adduced in temperate climates indicates that bottom heat in the propagating frames is usually necessary. There is no evidence however to show that the same is true in the tropics.

Light is another environmental factor demanding attention. It has occasionally been observed that leafy cuttings at the back of a propagating frame root more quickly than those at the front, and indeed experimental results would appear to indicate that the leafless cuttings of deciduous plants root best in darkness while leafy cuttings of evergreens require light to strike. The importance of moisture and aeration is universally recognised and do not therefore require emphasis.

The factors intrinsic to the plant material are less easy to control in experimental work and consequently the information concerning them is sparse. These factors,

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The factors intrinsic to the plant material are less easy to control in experimental work and consequently the information concerning them is sparse. These factors,

however, jointly operate in producing that type of cutting which the experienced propagator recognises by instinct, as it were, to be suitable for propagation.

The variation between species, and even between varieties of the same species, with regard to the ideal type cutting for propagation purposes is considerable, and is doubtless responsible for much of the conflicting evidence reported in technical literature. For example, some plants strike best from soft-wood cuttings while only hard-wood cuttings can be used for the propagation of others. Age, presence or absence of leaves, and oil, resin and carbohydrate content of the cuttings are also variable factors known to exercise a profound influence on rooting ability.

Influence of Hormones in Root Development.

Root growth promoting hormone is another intrinsic factor operative in the production of roots by cuttings. A cutting that strikes without artificial treatment with natural hormone or equally effective synthetic substance, either contains the hormone when removed from the parent plant or, as is often the case with leafy cuttings in the presence of light, produces the hormone while in the propagating frame. It does not, however, necessarily follow that failure to strike is due to the lack of an available supply of hormone; it may be due to the absence or excessive influence of any one or more of the numerous factors known to promote root formation. In fact, treatment of cuttings with synthetic substances which are as active as the natural hormone has not resulted in stimulation of root formation in many species and in some has even had a depressing effect. Nevertheless, the list of species which have been shown to react positively to treatment with synthetic substances is already large and is continually being added to. The response to treatment by these species results in:—

(1) an increased percentage of rooted cuttings.
(2) a larger number of roots per cutting, and
(3) acceleration of rooting.

Practical Value of Synthetic Hormones.

One of the foremost workers in this field of research—Dr. M. A. H. Tinker of Wisley, England—has classified the plants tested by him into three categories—those rooting easily, those fairly difficult to propagate, and those very difficult to propagate—and found that 90 per cent. of the plants in the first group, 66 per cent. in the second group, and 8 per cent. in the third group, were stimulated by treatment with synthetic substances. From the nurseryman's point of view there is obviously no benefit to be derived from treating cuttings which are known to strike easily and quickly without treatment, but the use of synthetic substances has an immediate practical appeal in cases where by treatment "difficult" cuttings can be made to root freely. While efforts to strike treated cuttings of species offering the greatest difficulty have not so far met with marked success, the proportion of species offering medium difficulty which have responded to treatment is reasonably high, and the importance of this in nursery-work can be readily appreciated.

The possibilities of synthetic substances in horticultural practice, however, is not confined to the propagation of "reasonably difficult" species. Among the easy rooting class of species, 90 per cent. of which react to treatment, the gardener knows of many that take a long time to strike. The cuttings of a number of evergreens are typical of the "easy but slow rooting" type, and experiments with some of these have shown that whereas treated leafy cuttings strike within six to eight weeks, similar untreated cuttings may take more than twelve months to form roots. Trials with types other than evergreens, embracing a large number of species known to be "easy but slow rooting" have also demonstrated the superiority of treated cuttings, although it is questionable whether the accelerated rooting obtained in the case of some species would justify treatment on a large scale.

In one other respect synthetic substances promise to prove of value to the propagator. A considerable number of plants can be propagated easily and rapidly but only during particular seasons. By treatment with synthetic substances it is possible to propagate some of these plants out of their normal season, and the value of the treatment for such species is therefore dependent on the time of the year it is desired to propagate them.

It should be noted, however that the positive responses to treatment so far obtained have been almost entirely confined to leafy cuttings; the recorded cases of response by leafless cuttings are few.

As regards after-effects, the general experience is that the treatment of a cutting with synthetic substance does not produce any deleterious effects in the plant subsequently established. In fact, with few exceptions, the initial advantage of accelerated and increased rooting gained by a treated cutting over an untreated cutting is fully maintained in the growth of the plant produced.

While it is evident that very material benefit may accrue to the nurseryman through the use of synthetic substances, they must not be regarded as a panacea for all propagation troubles. As has already been pointed out, synthetic substances do not by any means always cause a positive response, and before employing synthetic substances for striking cuttings of a particular plant on a large scale, it is advisable for the propagator to satisfy himself by preliminary trials that the additional cost and labour involved in treatment will be justified. As a matter of interest it might be mentioned that some commercial nurserymen in Britain have incorporated treatment with synthetic compounds in their normal routine propagation of certain species of ornamental plants.

Methods of Using Synthetic Hormones.

In the course of experimental work with synthetic substance three methods of treatment have been employed. The method which has given the most satisfactory results to date and which is now favoured by the majority of workers, involves standing the base of the cuttings in water diluted solutions for a certain time and rinsing them with water before insertion in the rooting medium. The optimum concentration of the solution and the optimum immersion period in the solution appears to vary widely from plant to plant, and for a particular species or variety

can only be ascertained by experimentation. Generally speaking, however, the greater the concentration the shorter the period of immersion, but if the concentration is too great the cuttings fail to respond and will decay.

Of the other two methods, one consists in watering previously untreated cuttings in the propagating frame with solutions of synthetic substances, while the other involves application of the active agent in the form of a mixture with lanolin paste to the cutting before placing in the rooting medium. Neither of these methods, however, has proved as successful as immersing the base of the cuttings in the solutions.

Chemical manufacturers early appreciated the possibilities of synthetic growth promoting substances in horticultural practice, and there are now several proprietary preparations on the market containing one or other of the active synthetic substances in solution.

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THE RELATION BETWEEN FROND TRANSPIRATION AND YIELD OF SAP IN THE NIPAH PALM (*NIPAH FRUTICANS*)

By

V. M. Hinchy, M.Sc., F.I.C.,

Late Distillery Manager, Nipah Distilleries of Malaya Ltd.

While studying the nipah palm as a source of sugar, the daily variation in yield of sap was discovered to be a problem of considerable importance. As may be seen from Table I. the average yield from day to day can vary by as much as 30 per cent in a plantation of palms such as that situated at Kuala Selangor in Malaya. Under the system adopted on this plantation, a spathe was tapped once daily for a fortnight. The highest yield was obtained from spathes newly opened for tapping, the yield declining steadily throughout the period of tapping. In addition to this gradual decline in yield, however, there was a daily variation in yield which remained unexplained.

The plantation was supplied with an irrigation system and was not therefore entirely dependant on rain; yet it was evident that there was some relation between the flow of sap from the fruit spathe and the rainfall. It was especially noted that on dull days when the rain was light but continuous the yield of sap was abnormally high while heavy rain falling at night or for a short time during the day did not produce a proportional increase in yield. Further, variations in yield were found to be appreciable when the rainfall was zero or practically negligible.

The yield of sap from the spathe during the day consisted of about 30 per cent. of the total for the 24 hours. Table II is an example of some tests on spathes of varying periods in tapping. While "younger" spathes would appear to yield a higher proportion of sap during the day the average yield was 28 per cent. by day and 72 per cent by night.

The essential differences between day and night is a difference in atmospheric temperature and humidity. If the day is one of bright sunshine and relatively high atmospheric temperature, and particularly if there are high winds, the humidity of the atmosphere is low and consequently the rate of transpiration from the fronds of the palms is high. Transpiration take place to a less degree when the day is dull and cloudy, temperatures are lower and the humidity of the atmosphere is comparatively high. In Malaya the temperature drops steadily from 5 p.m. to 7 a.m. and humidity increases from 65 per cent to about 95 per cent. during that period. Thus it appeared that relative humidity rather than rainfall was the controlling factor so far as yield of nipah sap was concerned. Relative humidity was directly related to frond evaporation—as the former decreases the latter increases and *vice versa*.

An attempt was made to obtain a measure of the actual evaporation from the fronds of the palms and accordingly an atmometer was installed in the plantation on a level with the tops of the palms. The atmometer consists simply of a porous

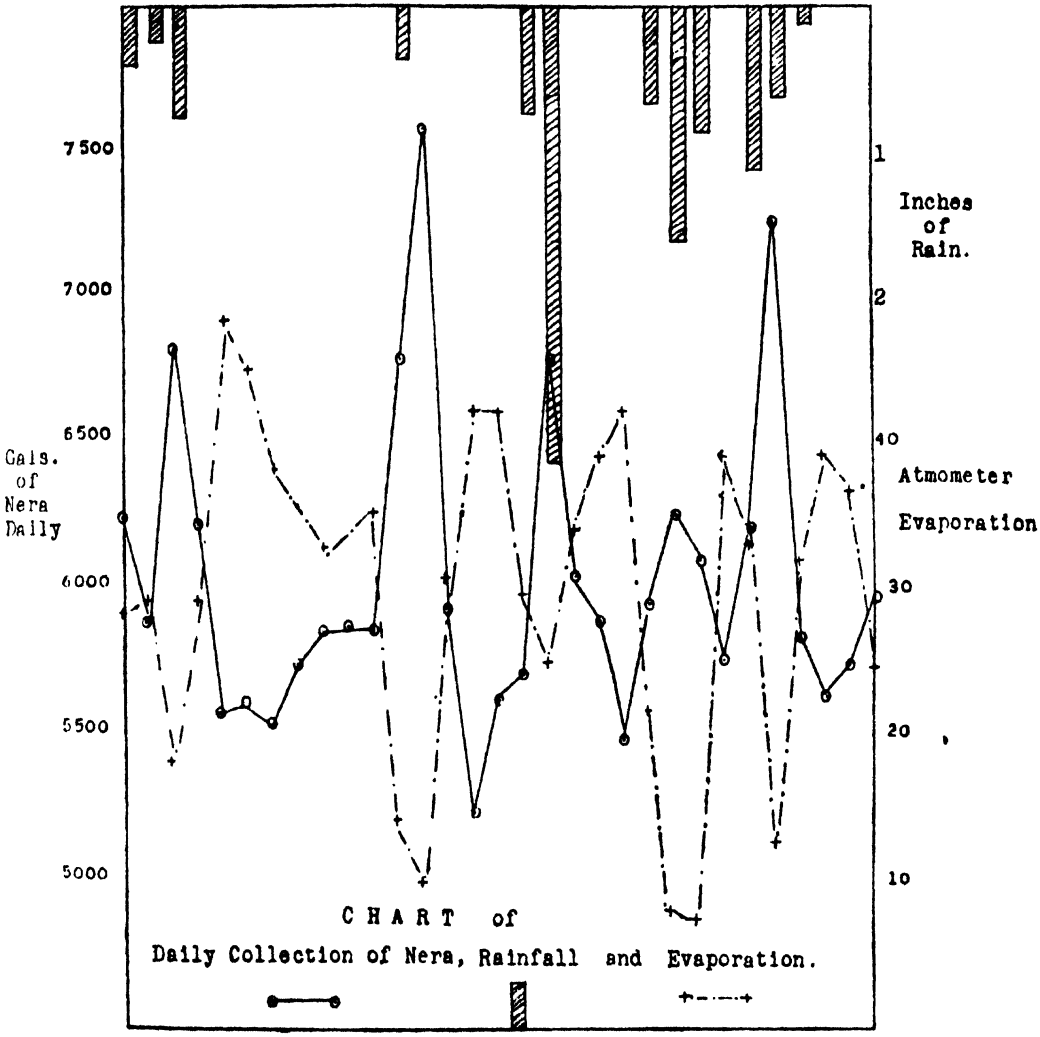
Table I.

Field 13A.	Variation in volume of Nera per Spathe											24 Hours collection.	
Spathe No.	1	2	3	4	5	6	7	8	9	10	11	12	Total ozs.	ozs. per spathe.
Days in Tapping.	16	16	16	16	16	16	16	16	16	16	16	16		
26th Oct. ...	23	12	24	24	40	37	26	24	40	40	27	27	344	28.6
27th Oct. ...	19	9	16	17	30	20	20	22	36	30	10	20	249	20.7
28th Oct. ...	19	9	19	17	33	33	21	21	25	32	19	22	270	22.5
29th Oct. ...	16	6	15	14	33	30	21	20	37	29	21	20	262	21.8
30th Oct. ...	22	13	25	23	44	41	30	29	43	44	21	30	365	30.4
31st Oct. ...	12	6	17	12	35	28	20	20	36	30	15	22	253	21.1
1st Nov. ...	14	8	19	14	38	34	20	26	40	40	16	26	295	24.6
2nd Nov. ...	16	7	21	18	36	34	20	26	42	40	20	24	304	25.3
Average: ...	17.6	8.75	19.5	17.3	36	32	22	23.5	37.4	35.6	18.6	24	293	24.4

Table II.

Field 11B.	Variation in volume of Nera per Spathe												Day and Night Collection.	
Days in Tapping. ...	30	15	15	15	15	92	45	92	15	45	60	15	Total ozs.	ozs. per spathe.
Day ...	7	7	4	7	9	12	16	4	7	9	5	6	93	7.75
Day ...	7	5.5	3	6	8	10	14.5	1	6.5	3	4	5	73.5	6.0
Average ...	7	6.25	3 5	6.5	8.5	11	15.25	2.5	6.75	6	4.5	5.5	166.5	6.87
Night ...	16	12	7	14	17	31	40	10	10	27	10	14	208	17.03
Night ...	18	11	5	15	20	31	43	10	12	22	11	14	212	17.6
Average ...	17	11.5	6	14.5	18.5	31	41.5	10	11	24.5	10.5	14	420	17.5
Percentage Day ...	29	35	37	31	31	26	27	20	38	20	30	28	28	
Night ...	71	65	63	69	69	74	73	80	62	80	70	72	72	

Chart I.



January 1937.

Table II.

Field 11B.	Variation in volume of Nera per Spathe												Day and Night Collection.	
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Day ...	7	7	4	7	9	12	16	4	7	9	5	6	93	7.75
Day ...	7	5.5	3	6	8	10	14.5	1	6.5	3	4	5	73.5	6.0
Average ...	7	6.25	3.5	6.5	8.5	11	15.25	2.5	6.75	6	4.5	5.5	166.5	6.87
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Night ...	71	65	63	69	69	74	73	80	62	80	70	72	72	

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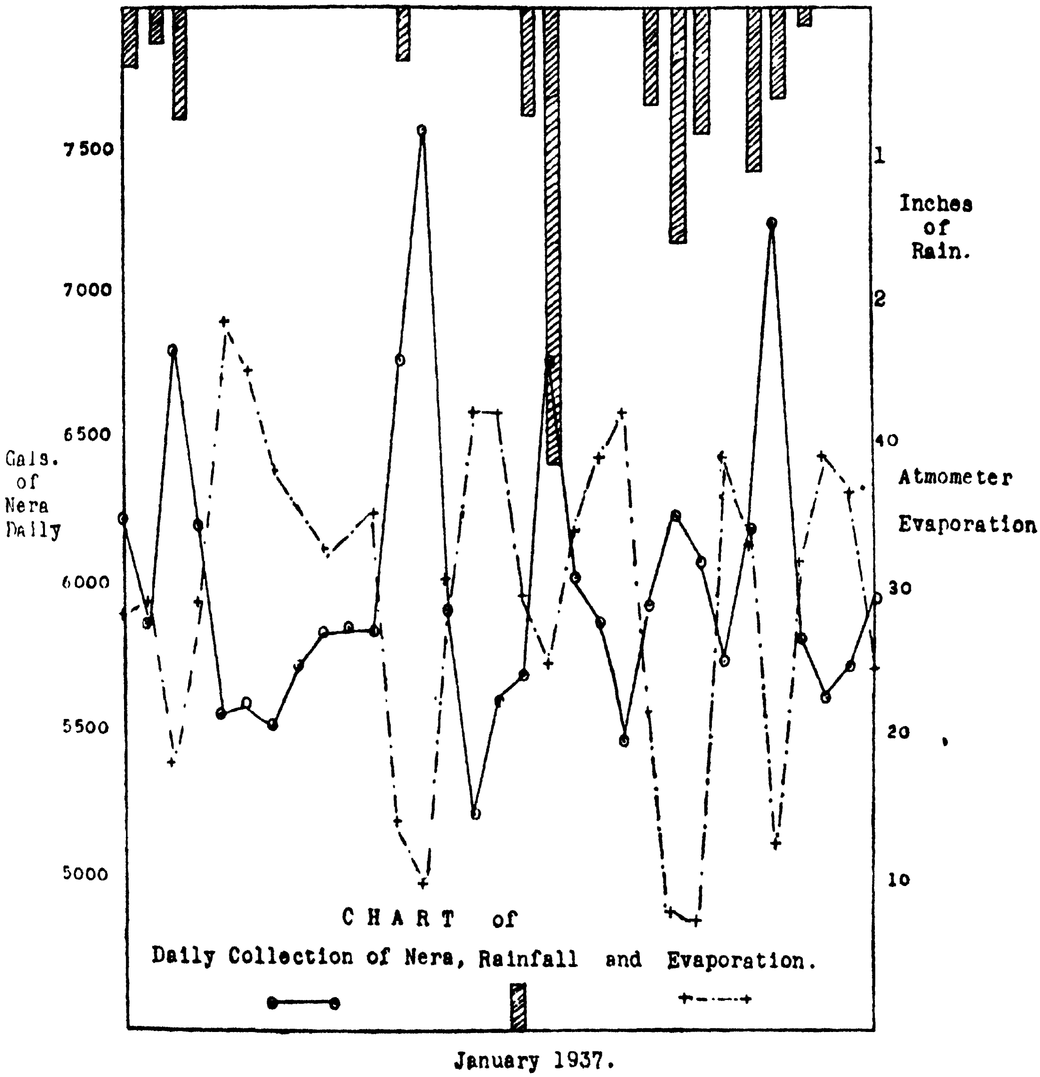
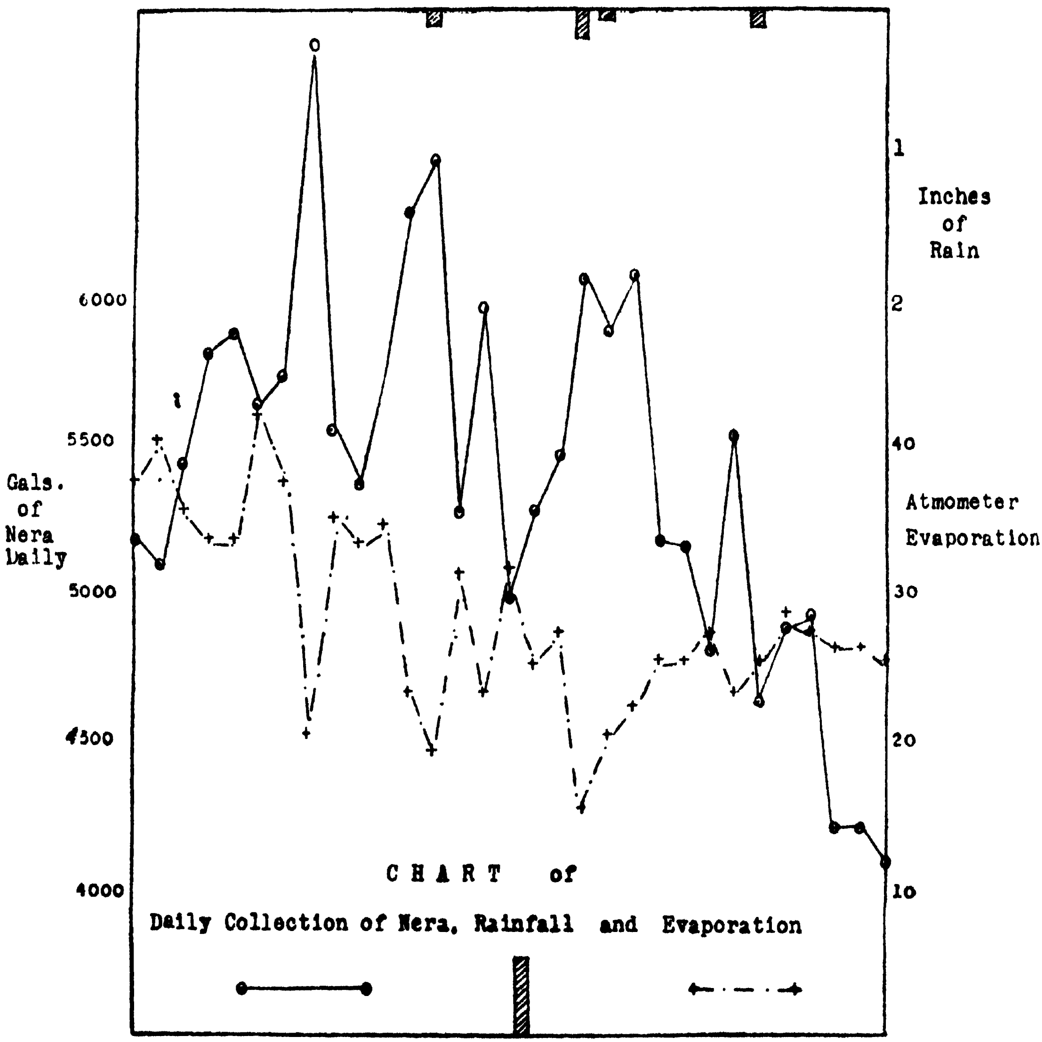

7500
7000
6500
6000
5500
5000
Gals.
of
Nera
Daily
1
2
40
30
20
10
Inches
of
Rain.
Atmometer
Evaporation
CHART of
Daily Collection of Nera, Rainfall and Evaporation.
January 1937.

Chart II.



August 1937.

clay pot connected by a glass tube with a bottle of water. The quantity of water evaporated daily from the porous pot is measured from a graduated cylinder used to refill the bottle. Graphs of the rate of evaporation and the yield of sap from the area of about 500 acres were compared and proved most interesting. Continuously for a period of about 18 months the relation was checked so that it was possible at 7 a.m. to forecast very closely the yield of "nera" (sap) from the estate for the day. Delivery to the factory was completed at about 1 p.m.

Charts I. and II. are reproduced as examples of the results obtained. During the month of January 1937 (Chart I.) the rainfall was considerable but the transpiration as recorded by the atmometer gave a much better indication of the yield from day to day and "explained" the rise and fall in yield. In August 1937 (Chart II.) the rainfall was almost negligible yet the peaks and troughs of the curves coincided in a remarkable manner.

It is obvious that a nipah plantation so sensitive in its output to variations in atmospheric humidity should not be exposed to brilliant sunshine and high winds and that to obtain a maximum and consistent yield of sugar-bearing sap, conditions of high humidity are essential. Shade trees and wind breaks should be provided, not so dense as to exclude light and air which are so necessary for fruiting yet sufficient to disseminate the rays of the midday sun and to protect the palms from the full force of the drying winds. Inter-planting of coconuts with the nipah palms is no doubt the best solution of the problem and there is little doubt that under such conditions the yield of sap from the nipah palm would be maintained at a high level and the average production for the month made considerably more profitable.

Received for publication 2nd August, 1938.

Selected Article.

THE COMMERCIAL PRODUCTION OF SUGAR FROM THE NIPAH PALM[1]

By
VICTOR M. HINCHY, M.Sc., F.I.C.

Nipah (*Nipah fructicans*) is a type of trunkless palm indigenous to the Philippines, Borneo and Malaya. The flower stalk rises from the ground, grows to a height of 4 to 5 ft., and produces a fruit which matures in about six months. The sugar juice is obtained by removing the fruit and hanging upon the end of the stalk of a small earthenware pot. Provided that the wound is kept open the flow of juice continues day and night for about three months till the stalk has been completely cut away. Inversion and fermentation of the sucrose is avoided by the use of preservatives and the juice is collected for transport to the factory daily. Factory treatment follows mainly the established methods for sugar production, and the nett result is sugar to all intents and purposes indistinguishable from that obtained from other natural sources.

Advantages of its Production.—The commercial production of sugar from the Nipah palm is a new industry which would appear to hold out decided advantages over beet or cane. The outlay of capital, which is essential for the planting of beet and cane, the former yearly and the latter yearly also or at intervals of a few years, is a considerable item constantly recurring in the table of costs. In comparison the Nipah palm once planted continues to yield indefinitely. No evidence of natural decline or death of the palm has been discovered, while its constant multiplication of palms or "stands" actually necessitates periodic thinning out to maintain fruiting at the maximum.

Under plantation conditions in Malaya the palm has been found to flower and fruit throughout the year, so that manufacture of sugar can proceed continuously instead of for a comparatively short season, as is the rule with beet or cane. It is of no small importance at the present day that all the staff and labour of a Nipah plantation and factory are kept in constant employment.

For a certain yearly output the plant of a Nipah factory may be less than half the size of that in a cane or beet factory. Not only is there a reduction in the size of the boiling-house unit, but no extraction plant is required to obtain the sugar juice, a tremendous saving in initial and running costs compared with those factories which must use expensive diffusion batteries or cane mills. The losses of sucrose, which are inevitable and sometimes considerable during extraction from the raw

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[1] Extracted and published in the *International Sugar Journal* 1938. 40. pp. 301—303 from a monograph bearing the same title published privately (in mimeograph form) by the author, copies of which have been presented to the principal technical libraries in London, New York and Washington.

material by battery or mills, are automatically eliminated and the juice enters the Nipah boiling-house with 100 per cent. of its original sugar.

With a distillery operating side by side with the factory the proportions of sugar and alcohol can be varied to meet market requirements, since production of alcohol from the raw material is even simpler and more direct than from the factory molasses and cheap, since no preservative is then introduced into the collecting pots on the fruit stalks.

Nipah Plantation in Malaya.—The only plantation of Nipah palms in the world at present is located at Kuala Selangor in the Federated Malay States. It comprises 1,900 acres owned by the Nipah Distilleries of Malaya Ltd., 700 acres held by this company under a Temporary Occupation Licence, and 200 acres retained by the Government as a Malay reserve. All the palms are now mature and preliminary tapping over an area of some 500 acres for a period of about four years has given opportunity for the collection of data and the establishment of methods of cultivation, tapping and collection of the sugar juice from the palm. At a point on the plantation convenient for river traffic there has been erected a distillery capable of producing yearly some 2,000,000 galls. of 95 per cent. alcohol, and a small factory in which the system of manufacture of sugar from the Nipah juice has recently been worked out. This factory at present has a capacity of about 1,500 tons of sugar per annum.

The original intention was to produce power alcohol from the Nipah juice for use in Malaya but political difficulties made this project impossible, and it was then decided that sugar should be the main product, sufficient alcohol only being distilled to supply the local demands for methylated and rectified spirit and for potable liquors.

Production previous to 1934.—GIBBS[2] described some laboratory experiments made in 1911 on the production of sugar from Nipah juice in the Philippines. Twenty new bamboo joints were coated inside with a thick mixture of lime and water and placed in position on the fruit stalks at 6 p.m. At 6 a.m. next day the juice which had flowed during the 12 hours was collected in a glass demijohn and transported to Manila. It was filtered 28 hours after collection, the clear filtrate measuring 15 litres (31.68 pints). Four litres of the juice were heated to boiling in a large porcelain evaporating dish, and carbon dioxide gas run in until the alkalinity was reduced to 0.10 grm. CaO per 100 c.c. of solution. This solution was then filtered and analysed.

The process of evaporation was continued, and alkalinity further reduced with sulphur dioxide to 0.01 grm. CaO per 100 c.c. of liquid. This solution was again filtered and analysed. On boiling down to a massecuite and cooling, crystals of good grain were obtained, these on drying in a hand centrifuge and finally in an air oven at about 90° weighed 157 grms. were pure white and polarized 96.8 per cent.

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[2] *Philippine Journal of Science*, A.6, 1911, p. 141.

WELLS and PERKINS[3] used a crude vacuum evaporator in 1922 to concentrate some Nipah juice which had been preserved with lime and afterwards treated with compressed carbon dioxide gas. They boiled down 844 litres of juice and obtained 67 kilos. of sugar polarizing at 87°. They stated that no difficulty was found in refining a portion of this sugar to a pure white product.

Pending further investigation they recommended small scale plants requiring but small investment. They stated "the use of open pans instead of vacuum apparatus makes the boiling-house inexpensive, but the replacement of a large scale carbonatation equipment by home-made apparatus is more of a problem. The Indian method of using so little lime that it need not be removed does not seem efficacious in Philippine Nipah swamps, so carbonatation or some equivalent process must be employed."

Production in 1934.—When the writer visited Malaya in November, 1934, sugar production of a very crude and primitive type was in operation on the palm plantation. Preservation of the juice during the 24-hour period of collection from the palm was incomplete, there being in use only a badly burned shell lime, produced on the estate. Removal of this lime at the factory by heating, settling and the addition of a small quantity of phosphoric acid was not complete and a highly alkaline liquid was being sent on to the evaporators for concentration to syrup. Evaporation was being carried on under atmospheric pressure in open coil pans of considerable dimensions, and final concentration was being obtained by boiling small quantities of syrup for long periods over open wood fires. The massecuite was left to crystallize in wooden boxes for some days and then centrifuged. The sugar was spread out on copper-lined tables to dry in the sun.

Preservation of Raw Material.—The Nera or juice as it drips from a freshly tapped stalk or spathe is slightly alkaline in reaction and is thus an unfavourable medium for the growth of organisms. However, if no means of preserving the Nera is applied, local yeast and bacteria and possibly enzymes in the Nera itself rapidly infect the sugar liquor, causing inversion of the sucrose and subsequent fermentation to alcohol.

The problem of discovering a suitable preservative for the Nera had been engaging the attention of the Malayan Department of Agriculture for a considerable time. They experimented with such preservatives as sodium fluoride, sodium sulphite and bisulphite, copper sulphate and acetate, alcohol, etc. Though these compounds were effective to varying degrees, they were not practicable for sugar manufacture. Eventually it was decided that thick lime solution was the most suitable from the factory point of view.

Thus it happened that the writer arrived in Malaya to report on Nipah sugar production equipped with samples of electrolytic chlorine and "Perchloron."

Both the electrolytic chlorine and the "Perchloron" were found to be excellent preservatives if doses were given twice daily, but on the score of economy it was decided to use the chlorine disinfectant during the day only, and to add a lime

[3] *Philippine Journal of Science*, 1922.

solution made from a good stone lime to the pot to prevent inversion during the night. The quantity of lime added was thus considerably reduced and this was afterwards removed without difficulty in the factory.

Transport of Nera.—Transport of the Nera in the older areas in tapping was from the tapper's bucket to large earthenware jars (where the quantity per task was checked), then to bronze-lined punts on canals, and finally through electric pumps to tank cars on the main railway line. As newer areas were opened up side lines at right angles to the main line divided the fields into blocks of about 20 acres each, and the Nera was transferred direct from the earthenware jars to the tank cars standing on these side lines Internal combustion locomotives using Nipah spirit conveyed the cars of Nera rapidly to the factory.

Factory Practice.—The next and extremely important problem was the removal of the excess lime and the production of a clarified juice as nearly neutral as possible for supply to the evaporators. To neutralize the whole of the lime with sulphur dioxide, phosphoric acid or other clarificants would have been extremely costly and the bulkiness of the precipitate would have rendered subsequent treatment of the muds extremely difficult. Accordingly, as the result of laboratory experiments, a system of double heating with 1st and 2nd subsiders was arranged. In the first subsiders the raw Nera was heated by closed coils to a temperature of 68°C. and allowed to subside. A heavy precipitate containing most of the lime added in the field settled out at this stage, and clear amber-coloured liquid, still alkaline, *pH* about 9, was drawn off by cocks at the side.

This first subsider juice was pumped to treating tanks where phosphoric acid in the form of double concentrated superphosphate was added to reduce the *pH* to about 7.2. The treated juice was then pumped through the juice-heater and discharged to the second subsiders at a temperature of about 98°C. Subsidation was very rapid and the muds formed a compact mass less than 10 per cent. of the total volume. The clear juice from the second subsiders, still slightly alkaline, passed direct to the evaporator.

The muds from the first and second subsiders were sent together to the mud tanks where they were blown up with live steam, a small quantity of phosphoric added to reduce the alkalinity, and allowed to settle. About 50 per cent. clear liquor was drawn off and returned to the first subsider clear juice tank, and the muds were finally further diluted and sent to Taylor filters.

In India it was found that Palmyra palm muds filtered slowly and with great difficulty through pressure filters, and as the Nipah palm muds were similar, Taylor filters were preferred to the more usual type.

The vacuum evaporator installed for the new factory was a triple effect of the Harvey type; operation was simple and concentration most effective. In the preliminary laboratory experiments the problem of eliminating the Nipah "tang" during manufacture was an exceedingly important one as it was obvious that the finished product to obtain a ready market should have no characteristic flavour to associate it with Nipah. It was found, however, that by evaporation under vacuum those

The present volume includes reports from three sources hitherto not represented in this compilation, *viz.* those of the Agricultural Officer, Brunei and Labuan, and the Report of the Canning Officer. Brunei and Labuan has now a resident Agricultural Officer, and the interesting summary of local conditions and of his work in these less known areas show that much useful work towards the improvement of the conditions of local agriculture is possible in these territories. The Report of the Canning Officer is included in this place for the sake of convenience. His work is mainly on pineapple research, but he is attached to the Field Branch and is stationed in Johore.

The reviewer has had occasion to study these reports carefully and has been impressed with the varied methods by which the officers concerned have devised and applied instruction to suit the needs of particular areas. In the "old days" a great deal of the time of the Field Officers was taken up in routine inspection of small holdings under the various Enactments, which resulted, where necessary, in prosecutions of small-holders.

Such a policy was dictated by the exigencies of the situation at that time and by the fact that the officers had large areas to control and therefore little time for instructional work. Happily the present larger cadre of Field Officers and the more thorough training of their subordinate staff at the School of Agriculture, Malaya, has rendered possible this change of policy, a change which is proving to be more effective than the old system of compulsion.

There is ample evidence in these Reports that the work of the Field Branch is attracting increasing attention amongst Asiatic planters.

D. H. G.

Miscellaneous.

REPLANTING AND MALARIA.

The Malaria Advisory Board invites the attention of all concerned with the management of estates to the danger of malaria resulting from the replanting of rubber. This danger is greatest in hilly country where the removal of old rubber provides ideal conditions for prolific breeding of *Anopheles maculatus*. Not only is there a great increase in breeding in streams and drains, particularly when these become blocked by trees being felled across them, but pits left by the uprooting of trees, holes prepared for replanting, silt pits and backward sloping terraces may all provide ideal breeding places.

It is suggested that, where possible, streams and drains should be put in order before felling and care taken to avoid blocking the drains by fallen timber. Pits left by the uprooting of old trees should be filled immediately if they are liable to retain water, and holes prepared for replanting should not be left open longer than is absolutely necessary. The Rubber Research Institute of Malaya advises that: "There is no necessity to leave the holes open for any longer than is necessary to check the actual work of digging them." (*The Planter*, September 1938). In many places silt pits and terraces are liable to retain water and measures should be taken to enable this to drain off. With the growth of cover plants such breeding places may become obscured, but are still a source of danger.

These measures should not be confined to a half mile radius from human habitations. When intensive breeding is allowed to develop beyond the half mile limit the value of anti-malarial measures in the controlled area may be largely nullified.

(*The above note was prepared by, and is published at the request of the Malaria Advisory Board, F.M.S.—Ed. M.A.J.*)

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Departmental.

FROM THE DISTRICTS.

September, 1938

The Weather.

In Kedah the abnormally wet weather continued. The heavy rain in conjunction with high tides caused flooding of the Muda River during the last week of September. There were also local floods in other parts of Kedah. In Penang, Province Wellesley, and Perak the rainfall was also rather above the average. The remainder of the Federated Malay States and Malacca experienced some showers but the weather generally was rather dry and water supplies in some parts were short.

In Kelantan and the northern parts of Pahang a normal amount of rain fell.

In Johore and Singapore as a whole the rainfall was about average, though there were local variations and some places were very dry.

Crop Reports.

Rubber.—The market price of rubber remained fairly steady though the threat of war in Europe caused a depreciation towards the end of the month. Smoked sheet was valued at between $20 and $34 per picul. In Penang the news of the crisis in Europe on the 29th caused a sharp fall in price of rubber of $7 to $8 per picul.

Although rubber is now commanding a good price, the last month has not seen any great increase in tapping by small rubber-land owners. Tapping and selling rubber without coupons is not attractive to the average small-holder at its present value of $5 to $7 per picul.

Rubber Grading Schemes.—Although it is as yet too early to decide as to the economic result of the grading of small-holders' rubber, there have been some indications of the progress of the scheme in different parts of the country. In Pahang, for instance, dealers have co-operated whole-heartedly with the Department of Agriculture in operating the scheme and the quality of smallholders' prepared sheet has materially improved. It has been suggested that in this State dealers are few and competition is not acute, so that they are able to impose cuts on poor quality sheet without losing business. In Perak, where the scheme has been only lately initiated, there are many dealers and much competition exists among them. It is said that although they exhibit a board of samples and prices, in accordance with instructions, small notice is taken of it and there is little difference in the price received for good and bad quality sheet.

Dealers in Selangor seem definitely antipathetic towards the scheme and a trial grading of rubber by the Asiatic Rubber Instructor has not proved a financial success.

Padi.—It is too early to assess the amount of damage done to the growing padi by the floods on the coastal plain in Kedah.

In Province Wellesley and Perak cultivation made good progress during the month though the water was excessive in some places. Some delay and inconvenience has been caused to cultivators owing to the destruction of nurseries by floods during August. In other parts of the country local scarcity of water supplies occurred; and in Pahang owing to the dry weather, the planting schedule is generally behindhand.

Two new mills commenced work in Province Wellesley. It is reported that the large established mills are to form a combined fund for the purpose of buying up and eliminating their numerous small competitors.

Final figures for the yield and distribution of selected seed from seed farms in Malacca are now available. They show that a total of 9,290 gantangs of seed was produced, of which 2,820 gantangs have been distributed.

The only considerable distribution has been made in the Southern (Jasin) District. This apparent lack of support is actually due to the fact that in the Northern and Central Districts the use of seed of approved varieties is already widespread and most cultivators therefore have their own supplies.

Bananas.—For many years banana growing has occupied an important place in the agriculture of Negri Sembilan and in Jelebu and the undulating inland hill areas there are very large tracts planted with this crop. These areas are invariably clean-weeded, erosion is extensive and loss of fertility rapid. Such land is occupied on Temporary Occupation Licence. After a few years, when the land is exhausted and a paying crop is no longer obtainable, the cultivator abandons his holding which rapidly becomes overgrown with lalang grass. Large areas of such lalang-covered hills can be observed in this part of the country.

Maintaining the fertility of land alienated for banana growing naturally has caused much concern to Government but considerable difficulty has been experienced in devising any method to prevent erosion owing to the nature of the crop, the method of cultivation, the antipathy evinced by the landholders and the fact that the rather low profits realized leave no scope for manuring or expensive anti-erosion measures.

Trials have lately been carried out with various types of cover plants and *mikania scandens* has so far been found to be the most suitable. A start has now been made with the distribution of cuttings to banana growers and it is hoped to induce every grower to establish this cover. Compulsion may be necessary if occupiers of steep land refuse to take the measures of erosion control recommended.

Efforts have been made to cause old abandoned land to revert to jungle, but these efforts have so far been fruitless as in dry weather these lalang areas are frequently swept by fire which kills any jungle vegetation which may have become established.

Applications have been received for some of this land for rubber planting but much of it is considered to be too steep for re-alienation.

DEPARTMENTAL NOTES.

Transfer of Mr. O. T. Faulkner, C.M.G., B.A.

Mr. O. T. Faulkner, C.M.G. Director of Agriculture, Straits Settlements and Adviser on Agriculture, Malay States, relinquished duty of these posts on 23rd September 1938, by reason of his appointment of Principal, Imperial College of Tropical Agriculture, Trinidad.

Mr. W. N. C. Belgrave, Chief Research Officer, has been appointed Acting Director of Agriculture, S.S. and Adviser on Agriculture, Malay States, from 24th September 1938 inclusive.

Paper on Tea Planting in Malaya.

Mr. B. A. Lowe, Agricultural Officer, Cameron Highlands, delivered a paper on Tea Planting in Malaya at the annual Conference of the Incorporated Society of Planters held at Penang on 23rd, 24th and 25th September, 1938.

Mr. Lowe's paper, and the other Papers read at the Conference, together with the Discussions thereon will be published in the September number of *The Planter*, price $1 or 2s. 4d. to be obtained from the I.S.P. Headquarters, Kuala Lumpur.

Destruction of Squirrels.

The campaign organized by the Department for the destruction of squirrels in Malacca has terminated for the year. It is announced that 66,480 squirrels were destroyed, a satisfactory result which should be of material benefit to owners of coconuts and fruit plantations who are the chief sufferers from this pest.

Leave.

Mr. J. W. Jolly, Agricultural Officer, returned from leave on 27th August, and assumed duty as State Agricultural Officer, Perak, from 31st August 1938.

Mr. H. N. Sands, Agricultural Officer, is acting State Agricultural Officer, Selangor, during the absence from the State of Mr. C. L. Newman.

Mr. A. de K. Frampton, Agricultural Officer, has been granted 217 days leave from 17th June 1938 to 19th January 1939, both days inclusive.

FERTILIZER PRICES, SEPTEMBER, 1938.

The following are the prices at the end of September, 1938,† of some of the more important fertilizers.

Product.	Analysis: Nitrogen (N)	Analysis: Phosphoric Acid (P_2O_5) Soluble	Analysis: Phosphoric Acid (P_2O_5) Insoluble	Analysis: Potash (K_2O)	Price per ton $
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

†Certain increases of price were announced during the last week of September, but were cancelled in 2nd October.

Statistical.

MARKET PRICES.

September, 1938.

General Conditions.

For most agricultural products, local market prices were steady or appreciated slightly in September. Rubber was adversely affected by the European crisis, but rapidly recovered. Pearl sago jumped from \$2.17½ to \$3.85 per picul owing to small supplies and good enquiry. The pineapple market awaits the coming into operation on 1st October of the Central Selling Agency; in the meantime, prices are nominal. The market for both copra and palm oil has still further declined.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, September, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan				Kuala Kangsar, Perak	Batu Pahat, Johore.			
	1	8	15	29	21	7	15	21	29
Smoked Sheet ...	33.50	33.30	33.00	28.00	33.00	31.70	—	—	—
Unsmoked Sheet ...	—	32.00	31.91	22.00	—	30.80	30.50	30.54	24.83
Scrap ...	No purchases								

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Pilah on 22nd, or at Kuala Kangsar on 7th, 14th and 28th September.

Major Crops.

Rubber.—Singapore prices varied around 26 and 27 cents per lb. until the last few days of the month, when the serious political situation in Europe caused a decline to the lowest point of 22 5/8 cents on 27th. On the last day of the month, with news of a European settlement, the price recovered to 27½ cents per lb. The average Singapore price for No. 1. X Rubber Smoked Sheet, loose was 26.21 cents per lb., as compared with 26.56 cents in August. Prices on the London market were less affected by the political situation the highest price during the month being 8⅛d. and the lowest 7⅝d., the average price being 7.92d. as compared with 7.85d. per lb. in August. The New York price averaged 16.04 cents gold per lb. as compared with 16.01 cents gold in August.

Prices paid for small-holders' rubber at three centres during September are shewn in Table I.

Palm Oil.—Prices declined still further over those ruling in August. The average of weekly quotations per ton in August were: palm oil £14.2.6, kernels £8.7.6; prices for September are shown in the following table.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
September 2	£ 12. 0. 0 Liverpool	£ 8. 5 0 Continent
„ 9	No information	No information
„ 16	13. 5. 0 Canada	8. 7 6 London
„ 23	12. 10. 0 „	8. 5. 0 Rotterdam
„ 30	13. 5. 0 „	8. 5. 0 London
Average September	£ 12. 15. 0	£ 8. 5 7½

Copra.—Singapore prices still showed a downward tendency, especially towards the end of the month. Sun-dried averaged $3.25 per picul and the Mixed quality $2.93 per picul, as compared with $3.43 and $3.08 respectively in August.

Copra cake was quoted throughout the month at $2.05 per picul.

Rice.—The average Singapore wholesale market prices of rice per picul in August were as follows:—Siam No. 2 ordinary $4.34, Rangoon No. 1 $3.82, Saigon No. 1 $4.05 as compared with $4.39, $3.92 and $4.02 respectively in July and $4.79, $3.92 and $4.12 respectively in August 1937.

The average retail prices in cents per gantang remained unchanged at Singapore 28, Penang 32 and Malacca 28.

The average declared value per picul of imports during August was $4.00 as compared with $3.91 in July and $3.97 in August 1937.

Padi.—In the main padi-growing areas the price of padi was slightly easier, generally from $8.50 to $9 per 100 gantangs. In more remote districts the price tended to rise, the quotations varying from $10 to $14 per 100 gantangs.

The Government Rice Mills in Krian paid $2.10 per picul for padi, and the Government Mill in Pahang from $2 to $2.25 per picul.

It is reported from Kedah that during the international crisis at the end of the month there was a heavy export of padi from the State and prices advanced 20 cents per bag of 28 gantangs.

Pineapples.—Packers are forming a central selling scheme and pending formation of this, values are nominal. The scheme aims at a price of $3.10 per case of 1½ cubes from 1 October. The Agricultural Officer, Singapore, states that the following prices per case were quoted:—G.A.Q. Spiral cut $3, Round cut $3.50, Cubes $3.00; Golden quality $3.20, $4.00 and $3.20 respectively.

The season for fresh fruit has now ended, factories in Johore and Selangor are closed, available fruit going to the Singapore factories. Selangor fruit was 50 to 60 cents per 100, Negri Sembilan $2 to $4 per 100, Johore South, 1st quality $1 to $2, 2nd quality 60 cents to $2.20, 3rd quality 30 cents to $1 per 100. In north Johore the three qualities were, for 100 fruits $2 to $3, $1.50 to $2, $1.

Beverages.

Tea.—Seven consignments of lowland tea comprising 370 packages and two of upland tea comprising 198 packages were sold on the London market during September. The lowland tea sold at prices between 1s. 0½d. to 11d., the average price being 11.64d. per lb. The upland tea sold at 1s. 2d. and 1s. 1¼d., the average being 1s. 1. 62d. per lb.

According to the *Tea Brokers' Association of London Report* for September the average London price per lb. realized during the month for consignments of tea from other countries were as follows:—Ceylon 1s.4.04d., Java 1s.1.77d., Indian Northern 1s.3.77d., Indian Southern 1s.1.31d., Sumatra 11.06d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 27th September, 1938, of the Ceylon Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 75, Medium Grown Teas 67, Low Grown Teas 62.

Coffee.—Sourabaya coffee prices in Singapore ranged from averages of $12.30 to $10.90 and Palembang coffee between $10.80 and $9.80 per picul, the price within the range depending on quality. Liberian coffee was quoted throughout the month at $14.50 per picul, Excelsa $9.00 per picul and Robusta $6.00 per picul.

Spices.

Arecanuts.—The average of highest and lowest market prices in Singapore during September were as follows:—Splits $7.30 to $4.85; Red Whole $6.68 to $5.19; Sliced $8.80 to $7.10, as compared with $8.22 to $5.10, $7.25 to $6.10, $9.37 to $8.19 respectively in August. The price within these ranges depends on quality.

The average of Singapore Chamber of Commerce quotations per picul were Best \$8.15, Medium \$7.70, Mixed \$6.90, as compared with \$7.62, \$7.01 and \$6.50 respectively in August.

Pepper.—Market stagnant, and prices lower. Average prices per picul in September were:—Black \$8.01, White \$12.45, Muntok \$12.70 as compared with \$8.12½, \$13.06 and \$13.31 in August.

Nutmegs.—Both 110's and 80's improved \$2 per picul early in the month. Average prices in September were \$30.60 per picul as compared with \$30.25 in August.

Mace.—Singapore prices in September were the same as for the previous month, *viz.*: Siouw \$80 and Amboina \$62 per picul.

Cloves.—Nominal prices were again quoted in Singapore throughout the month at \$40 per picul for both Zanzibar and Amboina cloves.

Cardamoms.—The latest available price for green cardamoms as given in *The Ceylon Chamber of Cemmerce Weekly Report* for 26th September 1938, is from 90 cents to Rs. 1.16 per lb.

Miscellaneous.

Derris.—The Singapore prices of derris during September remained unchanged at prices ruling in the previous month, *viz.* root sold on basis of ether extract \$14 per picul, root sold on basis of rotenone content \$18 to \$20 per picul.

Gambier.—Singapore prices per picul for gambier have been quoted throughout September as follows:—Block \$7.25, Cube No. 1 \$15, as compared with average prices of \$7.42 and \$5 respectively in August.

Tapioca.—Prices in Singapore during September were the same as those during the previous month, *viz.*: Flake Fair \$4.10, Seed Pearl 3.90, Medium Pearl \$4.50 per picul.

Sago.—The Singapore price of Pearl rose from \$2.17½ per picul at the beginning of the month to \$3.85 at the end of the month, the average price being \$3.18 as compared with \$3.75 in August. Flour Sarawak Fair was \$2.15 at the beginning of the month and \$2.50 at the close, the average price being \$2.29 as compared with \$2.04 in August.

Tobacco.—The price of uncured tobacco ranged between \$2 and \$6 per picul. Dry leaf in Johore was anything between \$5 and \$42 per picul. Prices of "cured" tobacco fell considerably in Kedah, but improved slightly in Penang and Province Wellesley. In Negri Sembilan prices in the Kuala Pilah District were over 100 per cent. higher than those ruling in the adjacent District of Tampin. Increased planting is reported from several States. The general range in prices per picul in the more important centres of production were as follows:—Grade I \$27 to \$38, Grade II \$20 to \$27, Grade III \$11 to \$18. In Kelantan prices remain very high:—I \$100 to \$160, II \$75 to \$128, III \$50 to \$112.

GENERAL RICE SUMMARY.*

August, 1938.

Malaya.—The imports of foreign rice during August were 83,031 tons† and exports 17,819 tons, net imports being 65,211 tons as compared with 63,985 tons in 1937.¶

Of the imports during August, 47 per cent. were consigned to Singapore, 21 per cent. to Penang, 5 per cent. to Malacca, 20 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. The August gross foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 51,371 (61.9), Burma 27,395 (33.0), French Indo-China 3,036 (3.6), other countries 1,229 (1.5).

For the first eight months of 1938, total imports of rice amounted to 544,570 tons of which 63.3 per cent. was Siam rice and 32.6 per cent. Burma rice.

Of the August 1938 exports, 81 per cent. were consigned to the Netherlands Indies and 19 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 13,320 (74.8), Burma 4,003 (22.5), French Indo-China 416 (2.3), parboiled 43 (0.2), Malayan 37 (0.2).

Net imports of rice during August by countries of origin were, in tons: Siam 38,051, Burma 23,392, French Indo-China 2,620, elsewhere 1,149.

India and Burma.—Foreign exports for the period January to July inclusive were 164,000 tons, as compared with 610,000 tons in 1937, a decrease of 73.1 per cent. Of these exports 3.0 (4.3) per cent. were to the United Kingdom, 4.9 (6.2) per cent. to the Continent of Europe, 37.2 (27.4) per cent. to Ceylon, 4.9 (22.9) per cent. to the Straits Settlements and the Far East, and 50.0 (39.2) per cent. to other countries. The percentages in brackets are for 1937.

Exports from Burma from 1st January to 24th August were 2,366,314 tons, as compared with 2,428,579 in 1937, a decrease of 2.6 per cent. Of the 1938 exports 41.2 (46.5) per cent. went to India, 9.8 (8.8) per cent. to the United Kingdom, 8.8 (10.8) per cent. to the Continent of Europe, 11.6 (10.9) per cent. to Ceylon, 14.0 (12.2) per cent. to the Straits Settlements and the Far East and 14.6 (10.8) per cent. to other countries. The figures in brackets are for 1937.

Average August prices in rupee cents per 100 baskets of 75 lbs. each at Rangoon were 222 for Big Mills Special, and 236 for Small Mills Specials, an increase of 3 and 2 rupees respectively over July quotations.

Siam.—Exports of rice and rice products from Bangkok during June were 120,219 tons, as compared with 60,949 tons in 1937. For the first 6 months of 1938 exports were 818,709 tons as compared with 501,782 tons in 1937.

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* Abridged from the Rice Summary for August, 1938, compiled by the Department of Statistics, Straits Sttlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Japan.—According to a report dated 5 September 1938, the final figures for the first Formosan rice crop of 1938 amounted to 685,055 tons, of which 432,744 tons was "Horai" rice, 243,601 tons Formosan "wet"rice and 8,710 tons Formosan "dry" rice. The total crop for the two previous seasons was 618,711 tons in 1937 and 664,559 tons in 1936. The actual yield of the first rice crop showed an increase of 32,989 tons or 5.1 per cent. over the estimate and is the highest rice crop record for Formosa.

The area under rice was 713,491 acres, a decrease of 4.3 per cent. in comparison with the corresponding period of 1937.

French Indo-China.—Entries of padi into Cholon during the first 8 months of 1938 were 840,320 tons as compared with 1,115,341 tons in 1937, a decrease of 24.7 per cent. Exports of rice during the same period were 872,371 tons as compared with 1,076,989 tons in 1937, a decrease of 19.0 per cent.

The Saigon rice report for July states that padi and rice prices were almost stationary. Demand from France was less active, that of other customers almost nil, but Hong Kong demand was maintained. The price of rice remained unchanged at $3.40 (Straits) per picul until the 12th and weakened to $3.39 per picul on 15th, and closed at this figure, after small fluctuations. Padi, with small arrivals, increased slightly from $2.20 per picul on 1st to $2.22 per picul on 15th, and $2.23 per picul at the end of the month.

Netherlands Indies.—According to *The Netherlands Indics Economic Bulletin* for May 1938, the area under rice harvested during January to March 1938 amounted to 1,205,360 acres, a decrease of 12.9 per cent. as compared with 1,383,200 acres for the corresponding period of 1937.

Exports of rice (in long tons) from Java and Mandoera to the Outer Provinces for January and February 1938 were 10,835 tons. Imports of rice into the Outer Provinces from abroad for the same period were 70,844 tons and into Java and Madoera 21,390 tons.

Ceylon.—Imports of rice for the first 8 months of 1938 amounted to 376,088 tons as compared with 360,267 tons in 1937, an increase of 4.4 per cent. Of these imports 17.6 (17.1) per cent. were from British India, 70.6 (70.2) per cent. from Burma, 0.3 (0.1) per cent. from the Straits Settlements and 11.5 (12.6) per cent. from other countries. The percentages in brackets are for the corresponding period of 1937.

Europe and America.—Shipments from the East to Europe for the period 1st January to 11th August 1938 were 904,396 tons, as compared with 816,309 tons in 1937, an increase of 10.8 per cent. Of these shipments 43.0 (45.7) per cent. were from Burma, 46.5 (47.2) per cent. from Saigon, 9.1 (5.0) per cent. from Siam and 1.4 (2.1) per cent. from Bengal. The figures in brackets are for 1937.

Shipments for the Levant from 1st January to 3rd August were 26,735 tons, as compared with 11,481 tons in 1937, an increase of 132.9 per cent.

Shipments for Cuba, West Indies and America from 1st January to 23rd July were 122,075 tons, as compared with 174,658 tons in 1937, a decrease of 30.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, JULY, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./July 1937	Jan./July 1938	July 1937	July 1938
Arecanuts ...	30,084	19,838	23,705	3.002	1,446
Coconuts fresh ...	95,223†	53,409†	61,053†	10,991†	10,584
Coconut oil ...	39,762	21,394	24,630	3,374	3,372
Copra ...	75,592	37,753	25,445	10,180	7,001
Gambier, all kinds ...	1,955	1,133	870	144	132
Copra cake ...	15,026§	8,020§	4,230§	1,925§	661§
Palm kernels ...	7,312	3,459	4,842	691	540
Palm oil ..	42,787	22.383	29,278	1,769	3,708
Pineapples, canned ...	80,502	55,866	49,689	9,138	6,989
Rubber ...	503,127¶	272.462¶	231,134¶	41,721¶	27,892¶
Sago,—flake ...	15,478	7,572	2,672	725	986
,, —pearl ...	3,759	1,722	2,318	251	380
,, —raw ...	8,256*	4,473*	3,240*	588*	193*
Tapioca,—flake ...	1,058	652	514	58	36
,, —flour ...	2,393*	1,066*	2,174*	211*	87*
,, —pearl ...	18,786	8,467	10,009	6	1,364
Tuba root ...	573	386	284	62	68

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
July	2,546.5	2,134.2	450.8	311.0
August	3,587.4	2,798.1	587.8	437.0
Total ...	18,004.5	13,926.2	3,183.8	2,308.0
Total January to August, 1937	16,794.0	11,947.0	2,925.8	1,929.3
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 31st August, 1938 were palm oil 2,031 tons, palm kernels 1,080 tons.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 31st August, 1938

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of tappable rubber not tapped: Estates which have entirely ceased tapping — Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems — Acreage	Percentage of (7) to (2)	Under rotational systems — Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped — Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,356	18,880	43.5	932	2.2	14,888	34 3	8,656	20.0	448	1.0	24,476	56.5
Malacca ...	121,665	55,638	45.7	4,095	3 4	31,170	25 6	30,762	25.3	1,735	1.4	66,027	54.3
Penang ...	2,488	1,192	47.9	nil	nil	1,236	49.7	60	2 4	18	0.7	1,296	52.1
Singapore ...	32,140	16,263	50.6	3,729	11 6	6,788	21 1	5,360	16.7	143	0.4	15,877	49 4
Total S.S. ...	199,649	91,973	46.1	8,756	4.4	54,032	27 1	44,838	22 4	2,344	1.2	107,676	53.9
F. M. S.—													
Perak ...	286,369	157,076	54 9	8,293	2.9	67,145	23 4	53,855	18 8	6,638	2.3	129,293	45.1
Selangor ...	323,691	194,225	60 0	6,364	2 0	58,816	18 2	64,286	19 8	6,855	2.1	129,466	40 0
Negri Sembilan ...	254,961	135,564	53.2	9,288	3 6	58,904	23 1	51,205	20.1	7,498	2.9	119,397	46.8
Pahang ...	86,291	47,757	53 3	3,571	4.1	24,383	28 3	10,580	12.3	6,379	7.4	38,534	44 7
Total F.M.S. ...	951,312	534,622	56.2	27,516	2.9	209,248	22 0	179,926	18 9	27,370	2.9	416,690	43 8
U. M. S.—													
Johore ...	475,823	270,815	56 9	18,035	3.8	118,080	24 8	68,893	14 5	32,443	6.8	205,008	43.1
Kedah ...	199,631	114,295	57.3	9,410	4.7	33,378	16 7	42,548	21.3	6,469	3.2	85,336	42.7
Kelantan ...	31,250	19,838	63 5	253	0 8	5,844	18 7	5,315	17.0	2,103	6.7	11,412	36.5
Trengganu (b) ...	4,817	3,182	66.1	nil	nil	74	1 5	1,561	32.4	74	1.5	1,635	33.9
Perlis (c) ...	1,371	667	48 7	224	16 3	417	30 4	63	4 6	86	6 3	704	51.3
Brunei ...	5,732	2,566	44.8	nil	nil	2,402	41.9	764	13 3	261	4.6	3,166	55.2
Total U.M.S. ...	718,624	411,363	57.2	27,922	3.9	160,195	22 3	119,144	16.6	41,436	5.8	307,261	42.8
Total Malaya ...	1,869,585	1,037,958	55.5	64,194	3.4	423,525	22.7	343,908	18 4	71,150	3.8	831,627	44.5

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only
(c) Figures for the quarter ending 30th June, 1938.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF AUGUST, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealers	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: Jan to Aug. 1938	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: Jan. to Aug. 1938	Imports: during the month: Foreign	Imports: during the month: From Malay States & Labuan	Imports: January to Aug. 1938: Foreign	Imports: January to Aug. 1938: From Malay States & Labuan	Exports including re-exports: during the month: Foreign	Exports including re-exports: during the month: Local	Exports including re-exports: January to Aug. 1938: Foreign	Exports including re-exports: January to Aug. 1938: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over	Consumption 3: during the month	Consumption 3: Jan. to Aug. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	10,260	16,743	9,833	89,140	3,582	41,415	Nil	Nil	Nil	Nil	10,539	4,802	98,373	30,142	...	7,008	18,053	16	126
Johore ...	...	4,043	6,903	4,338	40,747	2,535	24,501	Nil	52	Nil	196	2,496	4,866	24,179	40,390	...	2,954	7,555	...	...
Kedah ...	...	345	4,293	2,326	22,030	709	7,121	Nil	Nil	Nil	Nil	1,399	1,638	13,946	14,698	...	218	4,418	...	...
Perlis ...	...	31	25	8	102	16	175	Nil	Nil	Nil	Nil	Nil	29	Nil	251	...	25	26	...	...
Kelantan ...	...	728	445	351	2,910	431	4,923	Nil	Nil	Nil	Nil	265	419	2,175	5,463	...	767	514	...	...
Trengganu ...	...	55	50	249	2,106	124	1,053	Nil	Nil	Nil	Nil	Nil	373	Nil	3,159	...	55	50	...	...
Brunei ...	...	17	57	41	367	62	544	...	...	...	...	...	108	...	917	...	10	59	...	...
Total Malay States	...	15,479	28,516	17,156	157,402	7,459	79,732	Nil	52	Nil	196	14,699	12,235	138,673	95,020	...	11,037	30,675	16	126
S. SETTLEMENTS :—																				
Malacca ...	...	2,299	1,664	924	8,847	336	*4,044	Nil		Nil		1,865		18,913		...	2,103	1,808	...	...
Province Wellesley	...	3,081	735	339	3,294	337	1,948	Nil		Nil		6,217		59,118		...	3,224	757	...	...
Penang ...	1,149	5,660	15	14	144	59	655	3,130	10,527	19,760	98,017		Nil		Nil	1,134	6,392	8	...	...
Singapore ...	4,716	34,011	245	118	1,165	1	410	10,554		90,951		24,465		154,680		5,120	28,371	261	24	197
Labuan ...	...	47	Nil	Nil	Nil	11	95	51		379		Nil		Nil		...	49	Nil	...	...
Total Straits Settlements ...	5,865	45,098	2,659	1,395	13,450	744	7,152	13,735	10,527	111,090	98,017	32,547	Nil	232,711	Nil	6,254	40,139	2,834	24	197
Total Malaya ...	5,865	60,577	31,175	18,551	170,852	8,203	86,884	13,735	10,579	111,090	98,213	47,246	12,235	371,384	95,020	6,254	51,176	33,509	40	323

*Amended:—153 tons over reported in May and 1 ton under reported in June.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	6,053	27,505	6,161	5,220	2,329	87
WET RUBBER	955	866	231	166	625	131
TOTAL ...	7,008	28,371	6,392	5,386	2,954	218

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan to Aug. 1938
29	30	31
Singapore ...	33,847	246,925
Penang ...	8,994	87,660
Port Swettenham.	4,133	35,014
Malacca ...	272	1,776
MALAYA ...	47,246	371,384

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Aug. 1938
32	33	34
Malay States ...	26,880	233,218
Straits Settlements	2,506	20,172
MALAYA ...	29,386	253,390

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 22nd September, 1938

METEOROLOGICAL SUMMARY, MALAYA, AUGUST, 1938.

Locality.	Air Temperature in Degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.4	71.4	80.4	94	68	83	74	83.1	84.6	4.71	119.6	1.36	20	15	1	4	—	156.50	5.05	41
Bukit Jeram, Selangor ...	88.0	71.9	79.9	92	70	81	75	83.4	86.3	6.08	154.4	1.23	20	17	2	—	2	174.20	5.62	46
Sitiawan, Perak ...	88.9	72.8	80.9	92	71	82	75	84.3	85.4	4.54	115.3	0.60	16	13	1	—	—	181.00	5.84	48
Ipoh Aerodrome, Perak ...	89.0	71.9	80.5	92	69	83	74	82.3	84.1	10.04	255.0	2.47	21	19	4	—	1	163.05	5.26	43
Temerloh, Pahang ...	89.6	71.6	80.6	93	69	81	74	85.3	86.8	2.22	56.4	0.69	11	10	1	9	—	163.20	5.26	43
Kuala Lipis, Pahang ...	88.8	70.9	79.9	92	69	79	73	83.6	85.3	13.64	346.5	2.02	20	19	4	22	1	171.75	5.54	45
Kuala Pahang, Pahang ...	86.5	73.5	80.0	89	72	79	76	86.0	87.7	4.18	106.2	2.47	11	6	2	—	1	208.10	6.71	55
Kallang Aerodrome, S'pore ...	84.3	76.2	80.3	88	72	79	81	82.1	83.7	9.35	237.5	1.81	21	14	1	—	—	143.35	4.62	38
Bayan Lepas Aerodrome Penang ...	85.8	74.2	80.0	89	72	77	77	83.5	84.9	15.04	382.0	4.94	19	18	1	—	3	188.65	6.09	49
Malacca Town, Malacca ...	84.3	73.3	78.8	87	70	80	75	82.5	84.6	9.83	249.7	2.95	18	16	10	—	3	162.45	5.24	43
Kluang, Johore ...	87.1	70.6	78.9	90	69	81	73	81.3	82.5	4.30	109.2	1.30	15	10	4	6	—	148.05	4.77	39
Mersing, Johore ...	86.9	71.3	79.1	90	69	80	73	82.2	82.7	3.88	98.6	0.80	16	15	1	—	—	171.40	5.53	45
Alor Star, Kedah ...	86.3	73.4	79.9	90	71	77	76	84.2	85.9	14.07	337.4	2.10	25	21	1	1	2	174.00	5.61	46
Kota Bahru, Kelantan ...	88.7	73.4	81.1	91	72	85	76	84.6	85.4	12.67	321.8	2.74	19	18	5	—	—	220.95	7.13	58
Kuala Trengganu, Trengganu	87.5	72.2	79.9	91	70	76	74	82.9	85.3	5.57	141.5	1.90	14	9	2	1	—	195.30	6.30	51
Labuan ...	86.4	75.3	80.9	89	72	83	78	84.3	86.4	23.11	587.0	4.66	25	22	3	—	—	234.20	7.55	61
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.8	61.8	68.3	78	60	69	63	72.3	72.8	3.47	88.1	0.94	18	16	2	17	3	158.50	5.11	42
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.9	55.8	63.9	75	50	63	60	70.1	70.4	8.07	205.0	1.32	26	24	1	7	2	113.35	3.66	30
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.3	58.2	64.7	75	•54	63	60	*	*	7.84	199.1	1.28	23	23	*	*	*	115.15	3.71	30

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE

Malayan Agricultural Journal.

NOVEMBER, 1938

EDITORIAL.

Tamil Land Settlements. Few employers of Indian labour would be prepared to question the desirability of setting aside land for allotments for their labour force, for the advantage to the employer of possessing a settled and contented labour force is self-evident. It appears curious, therefore, that after the lapse of some 40 years of regular employment of Tamils, the well-organized and successful realization of this desideratum should be the exception rather than the rule. It is not our intention to point the accusing finger at any class of employer for failure in this direction but to indicate typical successful ventures as a basis for considering the prime objects of such schemes and the manner in which such objects may be achieved.

We therefore publish an article in this number on "The Settlement of Tamil Labourers on the Land" which records the observations of various officers of the Department of Agriculture who have at different times visited these centres, coupled with the observations of the Controller of Labour, whose duties are such as to provide him with unique opportunities for constant study of the projects and whose opinions therefore carry considerable weight We would also in this place acknowledge the value of the assistance of the Co-operative Department in connexion with the Chuah Settlement, and of the managers of estates who have at all times welcomed visits and advice.

The mere statement of such acknowledgments points to one lesson to be learnt from past experience, namely, no scheme of Tamil settlement on the land in this country, be it an ambitious scheme such as that at Chuah or merely small allotments on an estate, is likely to be successful unless it is assisted by the sympathetic guidance and encouragment of some one in authority—in the Chuah Settlement it is the Co-operative Officer, on estates it must be the manager and staff. We would emphasize that the nature of this encouragement is not necessarily by the provision of funds or capital in some cases this might in fact prove a reason for non-success of the scheme, for it is necessary to encourage the settlers to seek salvation by their own efforts rather than to expect the controlling hand to smooth out all difficulties. On the other hand, the provision of funds, especially in the initial stages of development, is in some cases justified and necessary, for one should not present a task of such magnitude as will lead to early discouragement.

In the article under reference we have dealt briefly with three types of development. Firstly, there is the settlement where the holding is the personal property of the labourer and sufficiently large to provide him with a living; secondly, a settlement in which the holdings belong to an estate and the labourers are definitely dependants of the estate, and thirdly, small allotments adjacent to the living quarters of employees on an estate. A fourth type of settlement has been advocated by a speaker recently, that is the development of specific areas of irrigable padi land to augment the food supplies of this country.

The objects of encouraging agriculture amongst Tamil labourers is to ensure a settled labour force in this country and to improve the health and economic condition of the individual. The chief difference between the more ambitious public schemes such as that at Chuah and the private schemes on estates is that an essential of the former is ultimately to give complete ownership to the settlers, whereas in the latter case, ownership of the land must be vested in the estate. The disadvantage to the Settlement of complete ownership is that the settler has the right of mortgage or sale of his property to any nationality and we visualize in this right the danger of disintegration of the Chuah Settlement.

There is a wide divergance of opinion as to the size of holding; in the instances given it varies from 4 acres at Chuah to as little as 1/16 acre on garden allotments. The guiding principle in deciding the area must depend upon the degree of independence it is intended to give to the holder. An area of 4 acres of good land will support a family, but where a small area is held the owner must augment his income by other work, while when the area is very small the outside work becomes the first consideration, the garden merely a spare-time employment.

But whether the scheme be ambitious or not, an essential of success is that the soil must be suitable for the purpose. Chuah, Permatang and Rubana are all alluvial soils, rich in comparison with inland soils. Similar attempts on the latter soils would in all probability come to grief unless adequate quantities of animal manure, or compost, were available.

The Controller of Labour has stressed the fact that the successful settlements are based on the keeping of animals. We agree with this view and would therefore suggest that all settlements other than small vegetables allotments should include adequate grazing reserves and the owners be encouraged to start by the introduction of suitable stock.

Finally, one is led to consider how far these schemes have or are likely to achieve the objects in view. With the allotment garden there can be no doubt of success, and managers have shown that they form a valuable insurance against shortage of labour, they can be run without danger to health through insanitary conditions, and that the labour has benefitted in a number of ways. In the case of the larger settlements the result is, we believe, not quite so certain. The tendency may be towards complete independence, or the settlers may only seek outside work when times are bad—when therefore the demand for labour is small. As against this, however, is the undoubted fact that the Chuah settler is fortunately placed. Many of them work daily on near-by estates, their wages from this employment

in addition to their profits from the holdings providing them with the money necessary to procure permanent titles to the land (about $60 for a 4-acre holding). Whether, when a settler has reached this independence he will be as anxious to secure outside employment remains to be seen, but it is at least probable that his children will be forced to provide for themselves, and only return to their "Malayan homesteads" when times are bad or the age of their parents necessitate that they should increase their responsibility to manage the family land.

Sexing of Chicks.

We include a short article by Mr. G. E. Mann, M.C., on the sexing of day-old chicks. Mr. Mann investigated two possibilities in which sex-linkage might occur in Canton fowls, one of which has been found to be of value with certain pure breeds, notably the Rhode Island Red.

The sexing of Canton chicks, if it could be successfully and easily accomplished, would be of great value to the local industry as there is a strong demand for pullet chicks in certain parts of the country.

The author carried out an exhaustive test of both methods with Canton chicks but, somewhat contrary to expectation, he found that they were entirely unreliable. The inclusion of these negative results in this Journal is considered justified, not only because the investigation is of interest, but so that future investigators may be saved the necessity of pursuing the same research with this breed.

Original Articles.

THE SETTLEMENT OF TAMIL LABOURERS ON THE LAND.

Introduction.

Although legislation exists in the Federated Malay States whereby estate managers are required to set aside land suitable for allotments for all labourers who have dependents, it is a regrettable fact that, for a number of reasons, well cultivated gardens exist on comparatively few estates.

A number of far-sighted managers have, however, given careful consideration to this question, and although success has not always attended efforts to organize such gardens on estates, there exist in this country a number of estates which now possess gardens or settlements of considerable merit.

It is thought that a brief account of the organization of this type of development may serve as a useful guide to managers who wish to develop spare-time agriculture on their estates. The following account goes a little further than this, for it attempts to outline the three types of schemes met with in this country, which are designed to settle Tamil labour on the land either permanently or temporarily with the idea of conserving the labour force in Malaya, improving their conditions of food and living, and assisting them during periods when there is little demand for labour.

The following account, therefore, touches on three different aspects of this subject, *viz.*: (i) Tamil Settlements, where the labourers are owners of their land—such as the Chuah Tamil Settlement and the Bagan Serai Settlement; (ii) Tamil Settlements in which the labourers do not own the land, but are semi-independent of the owners; (iii) Allotment gardens on estates.

THE CHUAH TAMIL SETTLEMENT.

The Chuah Tamil Settlement is 4 miles from the village of Chuah in the Port Dickson District of Negri Sembilan. It consists of 243 acres which were given out in 1932 to Indian settlers—all of whom had been in Malaya for about 20 years—on Temporary Occupation Licence in the first instance, with the proviso that permanent titles would be granted when the owners had paid the premiums, survey fees and rent. The fees are stated to be $10 per acre with an annual quit rent of $2 per acre and the title stipulates that no rubber trees may be cultivated. A remission of two-thirds of the survey fees, which amount to about $20 per 4-acre plot was agreed to by Government. Of the 69 settlers, 39 hold 4 acres each, 14 have three acres each and 16 have 2 acres each.

Nature of the Land.

The land consists of a flat coastal plain comprising alluvial deposits of clay intermixed with a certain amount of peat; the latter, however, is not present in sufficient quantity to result in the lowering of levels due to weathering.

The organization of the settlers has been in the hands of the Co-operative Department, through the Indian Co-operative Officer, Negri Sembilan (Mr. Thaver).

The object was to settle on the land a number of Tamil labourers who were at that time out of work. The scheme provided that the land should be granted in the first instance to a group of settlers and not to the individual members of the group. This group was given legal status by being registered as a Co-operative Society, and it was a condition of admission that only selected settlers should join the Society and they should act in accordance with the orders of the Committee. Failure to do so entailed expulsion from the Settlement. In this connexion it must be remembered that the settlers were without capital and without knowledge of the work which confronted them. The initial capital came from the sale of jewellery, goats and cattle and no financial assistance was given by Government. The advantage of this communal work was soon apparent; the whole area was felled at one time, and adequate drainage carried out at an early date. Once the felling was done, temporary structures were erected of bark and jungle wood and the settlers started to house themselves.

It has since been found that improvement works affecting the whole settlement are best undertaken on contract and the system is, after a contract price has been settled, to raise the money by a levy on the holdings and to stipulate that the contractor shall employ the settlers on the work; thus they are able to obtain a refund of portion of their contributions depending on the amount of work performed on the scheme.

The risk of disease, and in particular of malaria, was considerable. The Health authorities made a close survey of the area and gave advice as to the preventative measures to be adopted. These measures have been carried out under the supervision of the Society and there has been very little ill-health in the Settlement since its foundation. Periodical visits are paid by officers of the Medical Department, while from time to time the advice and assistance of other departments, in particular the Department of Agriculture and the Drainage and Irrigation Department, has been obtained.

More recently, a school and a temple have been built, and areas set aside for a grazing reserve and a burial ground.

Cultivation.

The area was well cleared and there are now but few logs and stumps.

The first cultivation mainly comprised padi and ragi; both crops showed vigorous growth, but ultimately suffered severe rat damage.

At the present time the settlers concentrate on pig keeping and there are said to be nearly 700 pigs on the Settlement, besides over 200 goats and a number of poultry. Poultry are less in evidence than formerly, stated to be due to a recent epidemic disease which resulted in many deaths. Practically the whole cultivated area is planted either with tapioca or sweet potatoes. These crops are used either for feeding the owners' pigs or are sold to neighbouring Chinese pig

keepers. A few fruit trees are found around homesteads, but no steps have been taken to devise a rotation of crops to conserve the fertility of the land and to augment the food of the people by the inclusion of crops such as maize, ragi and green vegetables.

The pigs are kept in sheds with slatted floors raised one or two feet above ground. The ground under the floor is invariably filthy and no adequate arrangements are made to collect and store the urine and dung for use on the land. Under these conditions the wells from which water is drawn for drinking and washing the pigs is in danger of contamination. It is stated, however, that the general condition and health of the pigs is good.

While some of the owners maintain their own pig sties and herds, others have amalgamated so that the sties are very large and labour is kept continually in attendance in looking after the stock. This appears to be a good system as the animals are given closer attention than would otherwise be the case, for at the present time a number of the settlers are employed on near-by estates and consequently can give attention to their own holdings only in the late afternoons. The stock is fed on the tapioca and sweet potato crops grown on the Settlement, supplemented by rice bran and "ikan busok" (fish waste).

The goats, which are healthy and in good condition, are housed in raised sheds and are given restricted exercise and are fed mostly on tapioca leaves and tops.

Economic Position of the Settlers.

The present system of agriculture adopted is evidently devised to produce a fair return from the land with the minimum of work. Such a policy is dictated by the present ability of the holders considerably to augment their incomes by work on estates in the vicinity. It might well be that a falling-off in the demand for labour would see the owners spend more time on their land, and therefore producing a wider range of crops than at present. The ever-present danger of having "all the eggs in one basket" is seen at the present time, for a recent fall in the price of pigs has materially affected the settlers. The continual cropping of the land with tapioca and sweet potatoes will lead to greatly reduced crops and therefore smaller profits from the pig industry. The soil, however, appears to be good, and should the need arise a wider range of crops could be grown on the land. In the meantime, consideration should be given to devising a rotation of crops which will ensure the food supply to the pigs and goats and conserve the soil, coupled with the manuring of the land with the dung from the sties.

SETTLEMENT AT BAGAN SERAI, PERAK.

A few Tamil Settlements have been established at different times and under various conditions, some of which have proved successful for a time and have then deteriorated, but in a few instances a considerable measure of success has resulted. Pride of place must be given to a successful Tamil Settlement at Bagan Serai in

Perak which is in charge of a resident priest of the Roman Catholic Mission. The Controller of Labour, Malaya, in his Annual Report for 1937 comments on this Settlement as follows:— "It was founded about 53 years ago and all the settlers living in it have been born in Malaya and have never visited India. The settlement owns about 700 acres of land and has a population of about 400. The original families were each given 5 acres of land as their own property on which to live and plant padi and as others arrived they were given the same concession. The majority lead a life exactly as in India. They till their land and only when in need of ready cash do they seek work elsewhere and then only for a limited period."

PERMATANG ESTATE SETTLEMENT.

The Permatang Estate Settlement is owned by Permatang Estate, Morib, Selangor, an estate devoted to the cultivation of coconuts and rubber. The Directors of the Estate have set aside an area of 63 acres of land for the benefit of their labourers. As the Controller of Labour states:—"The scheme was started in November, 1936, with the idea of getting a number of non-working dependent labourers to take up blocks of land and contribute something to the exchequer instead of loafing about the lines and being a drag on their relatives. It was hoped that some of the older workers would also take up land with a view to developing it in their spare time and retiring to live on it when they were no longer fit for work.........The area is divided into one acre blocks, 5 chains by 2 chains, the dividing lines being 3-feet drains. Each block is therefore adequately drained and there are no disputes about encroachment of one settler on the land of another."

"A small annual quit-rent of 25 cents is paid for a holding of 1 acre, and while all clearing and drainage is done by the estate, labourers are expected to use their own initiative as regards cultivation and maintenance of the holdings. Thus, except for an attap roof provided by the estate, labourers must build their own houses, and it is estimated that these cost anything from $10 to $15 each."

At first there was great reluctance to take up the land, but once this initial difficulty had been overcome by confidence that there was no hidden reason behind the offer of the estate, land was taken by the settlers, till at present 30 acres have been opened up and 5 acres put down as a grazing reserve. The population consists of 23 men, 21 women and 33 children.

Development of the Land.

Considering the short time that the settlers have been in possession of the land, considerable development has been achieved. Each holder possesses pigs and goats and cultivates his land with a number of food crops—mostly vegetables, besides tapioca and sweet potatoes for his own consumption and for feeding to his stock. The Estate has assisted by the provision of a nucleus of the stock for each holding, and has also found it necessary to arrange for the sale of pigs when ready for market to prevent the owners being exploited by the local buyers. When the

Settlement started poultry was kept, but the owners found it impossible to allow free range for the poultry because of the damage they did to the crops. By mutual consent, therefore, they have abandoned poultry-keeping.

This Settlement is as yet in its infancy, but with the aid of the sympathy and care of the Manager, it holds promise of considerable success.

LABOUR ALLOTMENT GARDENS ON RUBANA ESTATE

Probably the main factors influencing the success, or otherwise, of allotment gardens are firstly, the accessibility of the land set aside for this purpose and its distance from the labourers' quarters; secondly, the attitude of the employer towards the cultivation of these gardens and, lastly, the failure of individual labourers to take an interest in the scheme when, as frequently happens, no attempt is made to allot a prescribed area to each man. In this connexion it is interesting to note that, in recent years, labourers' gardens have been successfully established on a number of estates and the allotments on Rubana Estate, Lower Perak, are typical of the successful organization of such gardens.

Layout.

A long strip of flat land some 100 yards wide has been set aside for labourers' quarters. This is bordered on one side by rubber and a small patch of coconut palms and, on the other, by a cycling path and a light railway.

The quarters are of the cottage type and each family lives in a semi-detached building at ground level. Each unit consists of five detached buildings in a row representing ten semi-detached cottages.

The gardens, each 70 feet by 30 feet, adjoin the quarters and they are fenced off from each other by wire netting.

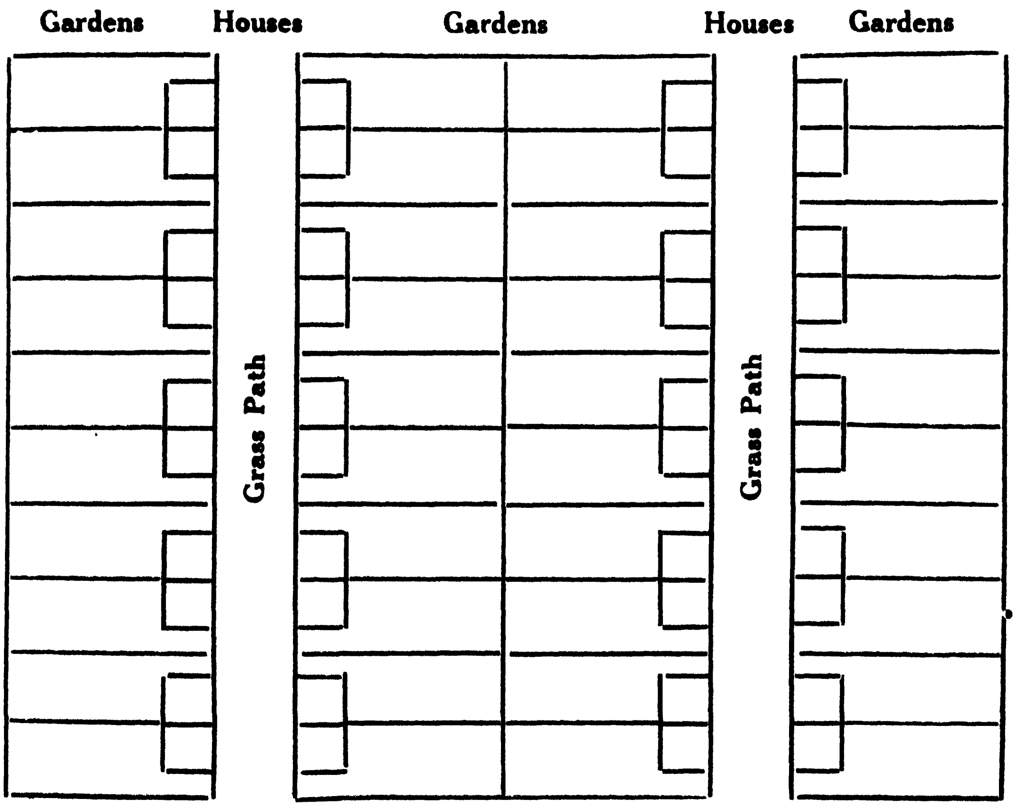
The pairs of units are so arranged that the gardens adjoin each other, while the houses are separated by a wide grass path with shade trees planted down the middle. On either side of this path shallow concrete drains have been constructed which keep the house sites dry in the wettest of weather. There is no permanent system of drainage for the gardens apart from the deep main drain which borders the rubber land, but small scupper-drains have been dug by individual labourers.

At the present time there are 94 occupied, semi-detached cottages with a corresponding number of gardens cultivated. In addition, it is anticipated that a further 48 families will be provided with similar new quarters by the end of June, 1939.

Cultivation and Bed Formation.

The gardens are hand-cultivated by "chankol" and there is a tendency to produce too coarse a tilth. However, with experience, the labourers should be able to envolve a system of trenching whereby the top layer of soil is not mixed with the subsoil. Similarly the methods of bed formation are not entirely satisfactory and the typical raised bed, some 4 feet wide, as constructed by Chinese market gardeners might well be used as a model for future development.

PLAN SHOWING LAYOUT OF GARDENS ON RUBANA ESTATE.



Manuring and Rotation of Crops.

The soil is a typical, moderately-fertile, alluvial clay which requires, for the growth of vegetables, some sort of organic manure to improve aeration and tilth. Fortunately there is sufficient cattle and goat manure available on the estate for the gardens and it is therefore possible to maintain the fertility of the land at a high level and, at the same time, to crop it intensively. In no case is any rotation of crops followed intentionally since, as in most gardens cultivated by Indians, different varieties are planted in a somewhat haphazard fashion. However, the proportion of leguminous crops grown is high and the general health satisfactory so it is possible that some unintentional rotation is in force.

General.

It is very noticeable that the labourers take a personal pride in the cultivation of their allotments. Furthermore, the proximity of each garden to the owner's quarters and the fact that each one is fenced reduces petty pilfering to negligible proportions.

Animal manure has always been available to the labourers and, recently, seed of improved or new varieties of vegetables has been distributed. Interest in gardening has been further stimulated by the recent establishment of a school garden alongside the estate school. This is being used for demonstrating correct methods of cultivation and bed formation to the children. In addition, it is also intended to use a garden attached to one of the new cottages for demonstration purposes. This consists of two series of raised beds divided by a central path running from the house to the boundary fence. All the work will be done by the labour force, under supervision, and the beds will be cropped according to a simple rotation.

It is considered that the amenities offered by the association of cottage lines and individual allotments are such that the extra cost of these quarters over the more normal type of lines and garden-reserves is more than counterbalanced by the efficient work performed by a healthy and contented labour force. In addition to the improved diet which ensues it is estimated that the produce from an average garden is worth some $2 per month to the labourer.

It is not so many years ago that labour employers were reluctant to spend any great sums on mosquito control: to-day this constitutes a very large item on the balance sheet as it has been shown that such expenditure is actually a saving. Similarly it seems safe to prophesy that, in the near future, more and more employers will realize that any project which substitutes a well balanced diet for the usual curry-and-rice of Indian labourers is likely to pay for itself in a short while.

INVESTIGATIONS ON THE SEXING OF DAY-OLD CANTON CHICKS

BY

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Introduction.

The local trade in day-old chicks is considerable. Thus, in Singapore alone, the Agricultural Officer reports that there are 12 Chinese hatcheries with a combined output of about 250,000 chicks a month. The market price is usually about 5 cents each (unsexed) but the Agricultural Officer has ascertained that Chinese poultry farmers would be prepared to pay up to 7 cents each for pullet chicks. Any method of sexing day-old chicks would therefore be of more than academic interest in Malaya provided it was simple and reliable.

Methods of Sexing.

In Europe and America where sexing is of great importance, two methods are commonly employed:

(*a*) The so-called "Japanese" method, first published in 1933, depending on an examination of the rudimentary copulatory organ. The method requires considerable skill and throws a great strain on the eyes. It is not employed in Malaya at present.

(*b*) A group of methods depending on the sex-linkage of certain hereditary characters. With the exception of two pure-breeds, it is necessary to cross certain selected pure-breeds for this purpose and the methods are not capable of widespread application in Malaya at present.

In 1935, Byerly* observed sexual dimorphism in the down-colour of day-old Rhode Island Reds in America. The chicks were divided into two groups, one having spots and/or stripes of melanic pigment on the head and/or back, the other being devoid of this pigment. Of 1102 chicks and embryos examined, 84.9 per cent. of the "spots and/or stripes" were female while 77.8 per cent. of the "non-spots' were male. Emphasis has since been laid on the necessity for black pigment, not red or any other colour.

Observations on Rhode Island Reds were begun at the School of Agriculture, Serdang, in April 1938. Only 167 chicks have so far been examined but about 70 per cent. accuracy in sexing has been obtained, which agrees fairly well with Byerly's results.

In other words, it is possible to separate R.I.R. chicks into two groups, one of which is preponderantly male and the other preponderantly female. The method is simple and is of definite value where other methods are not available, provided that a fairly large number of chicks (say 50 to 100) is involved on each occasion.

* *Poultry Science*, Vol. XVI, No. 6.

The presence or absence of spots and/or stripes of melanic pigment has since been observed by the writer both in R.I.R. x Canton chicks at Serdang and in Canton chicks at the Chinese hatcheries in Singapore. In both cases, where the pigment does occur it is more prominent than in the case of Rhode Island Reds. A fair proportion (but not all) of the chicks at these hatcheries are of the Canton type.

Investigations and Results.

The writer visited Singapore to investigate the possibility of sexing day-old Canton chicks as sold by the Chinese hatcheries. It was then learnt that the Chinese claim to be able to sex day-old chicks by the colour of the beak. The upper mandible is usually pink or slate-grey and terminates in a light pink or yellow point. Where two distinct colours occur, separated by a definite margin, the sex is alleged to be female; where only one colour is present, or where one colour shades gradually into another, the sex is alleged to be male. It was decided to investigate both methods simultaneously.

A total of 590 chicks of the Canton type was purchased from various hatcheries, half having black spots and/or stripes and half having no melanic pigment. Each group was killed by suffocation with coal gas, opened for post mortem examination, and the beak colour and true sex were then recorded.

Of 295 chicks without spots or stripes, 184 (62.7 per cent.) proved to be males. 140 out of 295 chicks with spots and/or stripes (47.5 per cent.) were females. Of the 590 chicks examined, 339 were males of which 184 (54.3 per cent) were accurately forecast; while of the 251 females, 141 (56.2 per cent.) were accurately forecast.

As regards beak-colour, there were 220 chicks with one-coloured beaks of which 114 (51.8 per cent.) were males; and of 370 with two-coloured beaks 144 (38.9 per cent.) were females. 114 of the 339 males (33.6 per cent.) and 144 of the 251 females (57.4 per cent) were accurately forecast.

Conclusion.

The results indicate that both "methods" are futile so far as Canton chicks are concerned. Similar results could have been obtained by dividing the chicks into two groups without any preliminary selection at all, calling one group male and the other female. The pigmentation of down and beak is interesting but is clearly not sex-linked.

Acknowledgments.

Acknowledgments are due to Professor Rosedale for the use of a laboratory and for help in preparing chicks for post mortem examination; also to the Agricultural Officer and Chinese Inspector of Agriculture, Singapore, for help in various ways.

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A ROOT DISEASE OF THE DURIAN TREE CAUSED BY *PYTHIUM COMPLECTENS* BRAUN.

BY

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Senior Plant Pathologist.

Introduction.

In 1934 the writer (1) recorded the presence of an infectious and fatal disease of the durian tree (*Durio zibethinus*) in Penang. This disease occurred in the form of "patch canker" of the bark of the main stem and was due to attack by the fungus *Phytophthora palmivora*. The fungus gradually killed affected trees by extending in the basal bark tissues until the stem was ringed. The trouble did not originate in the roots, and external signs of the presence of patch canker could be discovered in time to apply curative treatment and to save valuable trees from death.

In March, 1938, a number of durian trees, in a small fruit estate in Singapore, died and it was found that a root disease caused by the fungus *Pythium complectens* was responsible for the trouble on this occasion.

Field Observations.

The disease was first noticed when the branches of certain trees began to die back with the production of new shoots from the main branches below the "die-back" portion. About 50 trees were affected, both in groups and singly, and a number of them died out completely shortly afterwards. (Plate 1)

The bark of badly affected trees was brown and decayed at, and just above, soil level but definite symptoms of patch canker were lacking.

In a typical early case the upper lateral roots were healthy but the lower laterals, on one side, were affected by a decay extending from the tips along the cortex and wood to the tap root which had descended to about 4 feet (Plate 2).

In more advanced cases the decay had extended to the tap root and had begun to travel upwards to "ring" the cortical tissue at the collar. The affected roots were not disintegrated and, externally, appeared to be normal. Beneath the epidermis, however, the cortical tissue was dark brown and the wood, which was rather dry and soft, was of a pinkish colour flecked with brown.

The area—about 15 acres— had been planted with durian seedlings eight years previously. These had made fair growth and the trees were about 15 feet in height, and were in bearing at the time the disease appeared. The soil, a medium textured, yellow quartzite, had suffered from erosion as the ground slopes fairly steeply and the area had been clean weeded. The sub-soil is gravelly with signs of lateritic material at a depth of 3½ to 4 feet but there is no distinct "pan" at that depth.

The area is naturally well drained and when the trees were opened up for examination the soil was comparatively dry and is not of a type which would become waterlogged or excessively damp through lack of porosity, but it contains little organic matter, is poorly aerated and not very fertile.

Isolations.

Cultures were established from the margin of diseased and healthy root tissue, from decaying roots, from the tap root and from the decayed areas of the stem near the base.

Pythium complectens was isolated from the root tissue, in some instances as a pure culture, but not from the stem.

Diplodia sp. was present as a secondary fungus in decayed root tissue and this fungus was also obtained along with *Fusarium* sp. from the decayed basal stem tissue.

The Fungus.

Pythium complectens was originally described by Braun (6) as parasitic on cuttings of Coleus and Pelargonium in the United States of America. The fungus has also been recorded in Malaya by the writer (2) as a cause of "Patch Canker" and "Pod-rot" of the rubber tree; on lowland tea seed-bearers growing in badly drained, heavy soil where the fungus was associated with *Sphærostilbe repens* in a fatal root disease (3); on tea seed-bearers at Cameron Highlands (*loc. cit.*) where the fungus was present in the wood of the stem of trees attacked by *Ustulina zonata*, on carnation at Cameron Highlands associated with *Fusarium* sp. in a wilt; on oil palm from decaying bud tissue of a palm injured by lightning (4).

Sharples (5) has described the association of the fungus with cases of root and collar patch canker of rubber trees injured by lightning.

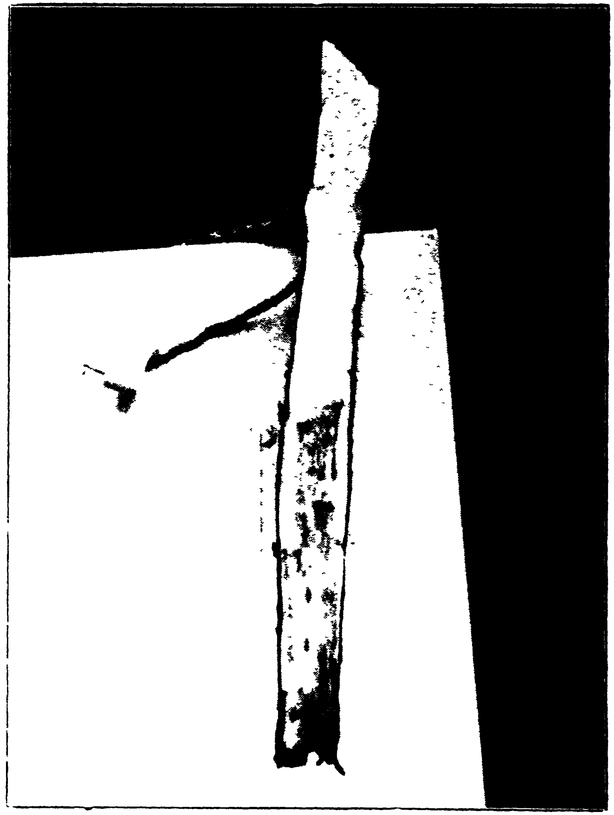
In culture, on agar media, the fungus forms large numbers of oospores. Sporangia are not numerous on media, in this country, but develop in water cultures and germinate either directly or by extrusion of zoospores in the manner characteristic of the genus Pythium. The oogonia of the durian strain are spherical and range from 14-24 microns with a mean diameter of 18 microns; the oospores average 16 microns, are smooth and may have a yellow wall. The sporangia are spherical and have a mean diameter of 21.5 microns.

Inoculations.

Diplodia and Fusarium had no effect on the tissue of healthy trees when inoculated into the bark but *Pythium complectens* was found to be parasitic. Details are given below.

Seedlings. Two durian seedlings, about 14 inches high, and growing in bamboo joints, were inoculated by placing portions of a pure culture of Pythium on to wounds in the bark of the stem at soil level and in the tap root. The inocula-

Durian trees attacked by root disease in the affected area at Singapore.



A diseased root of durian showing the decay advancing towards the tap root.

tions were kept moist. The results were negative after a month, when the seedlings were removed and examined.

Two seedlings were not wounded but were inoculated in the same way. After a month one was removed and examined and found to be healthy. The other was retained and was again inoculated on several occasions during the next six months. One month after the last inoculation it wilted and died. The root system was decayed and the plant had become "pot bound". *Pythium complectens* was isolated from the tap root, along with *Diplodia* sp. and bacteria.

Trees. The stems of two tall, healthy durian trees were wounded, inoculated with Pythium and kept moist with cotton wool covered with cellophane. After 10 days a patch of decay 6 inches long and 2 inches wide had formed in the cortex and cambium above the inoculation and the fungus had penetrated $\frac{1}{4}$ inch into the wood in the case of one tree inoculated during dry weather; a patch 12 x 2 inches and $\frac{1}{2}$ inch deep in the wood had formed in the case of the other tree inoculated during wet weather. The fungus was re-isolated from cortex and wood in both cases.

Inoculations without wounding the bark gave no results.

Inoculations with and without wounds on the roots of these trees were also successful, but the fungus advanced more slowly in the tissues. It was found difficult to avoid wounding the roots when exposing them and the finer feeding roots were injured in the case of the "unwounded" inoculations.

After 3 weeks the fungus had advanced about 2 inches into cortex and wood towards the tap root in the case of wound inoculations and had penetrated into the cortex of the "unwounded" roots. *P. complectens* was re-isolated.

A similar result was obtained by inoculating the roots of a stunted, 15-year old durian tree.

In order to avoid root disturbance, holes 1 foot deep were made with a stick around the base of a healthy durian tree and a suspension of zoospores was poured in. A plug of culture medium on which *P. complectens* was growing was then inserted into each hole and bricks were placed over the openings. Three months later the roots were examined but no trace of disease was found.

The fungus had no effect on wounded bark of a rubber tree (*Hevea brasiliensis*) and failed to attack the heart leaves of pineapple plants.

Discussion.

In general, species of the genus Pythium operate as parasites more effectively under conditions of excessive moisture and humidity, as for example in the "damping off" of seedlings which can be checked by promoting drier conditions.

It appears, however, that the species isolated from the disease of durians can operate under comparatively dry conditions, although it appears to extend more rapidly in the stem tissues during wet weather.

The results of inoculations of the stem of durian trees indicate that the fungus is a wound parasite which could operate in a manner similar to that of *Phytophthora palmivora* to cause "patch canker" of durian.

In view of the occurrence of a strain of this species in the roots and at the collar of rubber trees injured by lightning, the possibility that the attack by the fungus on the roots of the durian trees at Singapore followed injury to the affected trees, by lightning, was considered. A careful search of the area, however, gave no indication that lightning injury had occurred.

The root inoculations mentioned above indicate that the fungus is a facultative parasite of the roots of durian. It is probable, in the case of the successful inoculations, that the resistance of the inoculated roots was lowered by the inevitable disturbance of the soil and injury to the feeding roots when making the inoculations.

The fungus extended in the root tissue rather slowly in comparison with its rapid extension in stem tissue and failed to attack vigorous young seedlings, or the roots of a healthy tree exposed to infection by inoculation under conditions of minimum root injury, but appeared to have killed a young seedling when the roots became pot bound.

It is probable that the incidence of the disease in the area at Singapore is influenced by the present condition of the soil in the area which, as mentioned above, has not been protected from erosion since the trees were first planted.

It is considered that, in the present instance, *Pythium complectens* is responsible for the death of the durian trees, and that the fungus is acting as a facultative parasite of the roots of trees growing in soil which has declined in fertility.

Recommendations.

As a precautionary measure it was recommended that diseased and dead trees be uprooted and burnt, lateral roots extracted and infected areas isolated by trenches in the manner usually adopted in dealing with root diseases. Inspection of the lateral roots of trees, adjacent to diseased trees, should be carried out and cut ends of roots protected with a wound dressing.

When the diseased material has been removed from the isolated patches, cattle manure, compost or organic matter can with benefit be incorporated with the soil when filling in the trenches before replanting.

The question of manuring the remaining trees should be given consideration and efforts to recondition the soil, and to prevent further erosion, should be made.

Summary.

1. A root disease of durian trees, growing in poor soil, is described.
2. The fungus *Pythium complectens* Braun. was isolated from the diseased roots and shown, by inoculation, to be a wound parasite capable of causing patch canker of the stem and to function probably as a facultative parasite of the roots.
3. In addition to adopting the usual methods for treatment of root disease of trees it is suggested that manuring, reconditioning the soil and prevention of erosion should also be undertaken.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

3rd Quarter, 1938.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

During July and the first half of August very dry weather was experienced throughout the country. The latter half of August brought heavy rain, causing floods in Province Wellesley and Kedah, the seriousness of which in Kedah was enhanced by the Spring tides. September was wet throughout the country, in many places the rainfall being above average for this time of year, except in Malacca where dry weather was experienced. Pahang, however, experienced hot and dry weather throughout the quarter, with total rainfall for the most part below average.

Prices and Production.

Prices paid for small-holders' rubber are summarized in Tables I and II, which show the extremes and means of prices recorded at a number of centres in each State.

The price of rubber showed an upward trend throughout the quarter which was more pronounced in July and August than in September. This rise is ascribed in large measure to the reduced quota. The grave international situation at the end of the quarter caused a sharp drop in price, but on more favourable news from Europe the market recovered rapidly.

The actual price of rubber without coupons showed little variation during the quarter, the rise in price, in fact, being a rise only in the price of coupons. Coupons, at the end of the quarter, were around $26 per picul equivalent, and rubber without coupons at about $6 to $7 per picul.

Production of rubber on small holdings during the quarter is shown in Table III, which is prepared from the monthly reports of production, stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

Quality of Rubber.

Efforts to improve the quality of rubber in Perak appear to be meeting with but little success. Many smoke cabinets are now out of use, while the introduction of a grading scheme in one area has merely resulted in greater interest in advisory work but has resulted in little change in established methods. At a meeting of the Lower Perak Rubber Supervision and Advisory Board it was decided

Table I.

Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JULY				
Smoked sheet	32.00-28.00	33.00-29.00	32 50-27.00	32.55-27.80	33.00-23.00	33.00-26 50	34.00-29.00	32.25-25.00
Unsmoked sheet	32.50-27.00	30.50-27.00	30.00-25.00	31.00-21 00	31.00-26.00	31.00-28.50	32.00-25.00	30.00-24 00
Scrap	26.00-19.00	20.00-18 00	19.50-16.00	—	—	26.00-20.00	28.00-22.00	26.00-18.00
				AUGUST				
Smoked sheet	35.00-31.00	34.50-31.00	34.70-30.00	34 00-30.00	35.50-30.00	35.50-30.00	36.00-31.80	34.50-26.50
Unsmoked sheet	34.00-30.00	33.00-27.00	31.00-28.00	33.00-25 00	31.60-29 00	34.00-29.00	35.00-27.80	32.75-25.00
Scrap	29.00-20.00	24.00-20 00	19.50-16.00	—	—	27.00-24.00	29.00-21.00	27.40-24.00
				SEPTEMBER				
Smoked sheet	35.00-31.00	34.20-24.00	34.00-28 70	34.00-25.25	34.60-28.50	33.50-30.00	34.00-30.00	34.50-27.25
Unsmoked sheet	34.00-25.00	33 00-22.00	32.00-28.00	33.00-24.00	31.20-29.00	31.50-30.00	31.50-26.50	32.75-26.00
Scrap	29.00-20.00	26.00-24 00	28.00-25.50	—	—	27.50-25.00	29.50-21.00	29.50-25.00

Table II.

Mean of Highest and Lowest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JULY				
Smoked sheet	31.25-29.25	30.78-27.79	31.65-29.58	32.27-28.70	30.80-27.75	30.50-29.67	32.75-30.00	29.91-27.55
Unsmoked sheet	31.33-28.50	29.12-25.64	29.58-27.42	30.40-25.40	29.12-26.87	29.00-27.83	30.75-21.87	28.81-26.56
Scrap	24.00-21.57	20.00-18.00	19.50-16.00	—	—	24.33-23.17	26.50-23.50	24.98-22.83
				AUGUST				
Smoked sheet	34.50-32.00	32.20-31.19	32.82-31.34	33.46-31.34	33.33-30.38	34.00-32.17	35.12-32.57	32.41-30.30
Unsmoked sheet	33.25-31.13	31.50-29.05	30.98-29.53	31.70-28.30	30.77-29.10	32.50-30.50	32.87-30.20	31.20-28.75
Scrap	26.75-24.75	24.00-20 00	19.50-16.00	—	—	26.17-24.83	28.50-25.83*	26.41-25.33
				SEPTEMBER				
Smoked sheet	34.75-32.25	32.81-29.82	32 78-30.28	33.70-29.05	32.90-30.22	33.33-31.33	33.25-31.10	32.18-30.22
Unsmoked sheet	33.75-29.88	30.28-27.85	30.67-29.00	31.80-28.20	30.30-29.00	31.50-30.33	30.50-27.87	31.01-29.07
Scrap	27.50-23.63	26.00-24.00	28.00-25.50	—	—	27.00-25.83	27.87-24.50	27.50-26.40

*Not including one District where for scrap the very low price of \$15 to \$12 per picul was paid.

Table III.

Production of Rubber on Small Holdings.

(in tons)

	Total first 3 Quarters 1937	1st Quarter 1938	2nd Quarter 1938	3rd Quarter 1938	Total first 3 Quarters 1938
Federated Malay States ...	65,992	17,967	15,683	10,591	44,241
Unfederated Malay States ...	59,324	16,749	14,039	10,639	41,427
Straits Settlements ...	12,694	3,298	2,759	1,894	7,951
TOTAL MALAYA ...	138,010	38,014	32,481	23,124	93,619

to introduce at the beginning of 1939 a grading scheme based on the standard price at Singapore and the Teluk Anson exporters' grades. Experiments in commercial grading are being continued in Pahang.

In other parts of the country the position regarding grades of rubber prepared calls for no comment.

General Condition of Holdings.

From most States reports are received of improvements in the condition of small holdings, either by terracing, silt-pitting, general clearing up, or slashing the undergrowth, but there is no general inclination of small holders to effect improvements. It must be remembered, however, that a great number of holdings—especially those owned by Chinese and Indians—are in excellent condition, while the presence of undergrowth, slashed on occasions, on many other holdings is probably more of an advantage than otherwise, as it protects the soil from erosion. In some States a steady improvement is recorded. While undoubtedly there are extensive areas which are in a bad state, generally speaking, the present position cannot be considered as unsatisfactory, and owners certainly now give this subject greater consideration than was formerly the case.

Planting.

A few cases of replanting with budded material have been reported, but the total area is insignificant.

The position concerning new planting under the International Rubber Regulation Scheme calls for some comment. Small holders receive their rights for new planting in the form of share certificates, each share giving the right to plant

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of September, 1938.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	36,187	8,700	24
Kinta	38,874	5,800	15
Kuala Kangsar	92,166	50,000	61
Upper Perak	15,590	7.500	48
Larut & Selam	43,132	4,700	11
Krian	9,408	7,900	84
Lower Perak*	26,735	16,300	40
Dindings	9.873	7,600	77
	271.965	114,500	40

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	16,143	9.000	56
Kuala Langat	23,881	8,100	34
Ulu Langat	45,012	16,200	36
Ulu Selangor	31,463	11,000	35
Kuala Lumpur	20,277	14.600	72
Kuala Selangor†	8,417	3.600	43
	145,193	62,500	43

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	23.639	19,900	84
Tampin	21,896	17,700	81
Kuala Pilah	31,832	15,000	47
Jelebu	9,097	3,500	38
Port Dickson	11,133	8,900	80
	97,597	65,000	65

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	10,534	3,500	33
Kuala Lipis	15,457	3,600	23
Bentong	12.224	7.700	63
Other Districts†	40,373	18,000	39
	84,588	32,800	39

JOHORE	350,007	80,500	23
KEDAH	102,126	27,600	27
PERLIS	2,916	29,500	36
KELANTAN & ‡	49,133		
TRENGGANU	29,836		

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	14,093	8,300	59
Alor Gajah	30,838	15,400	50
Jasin	25,286	5,300	21
	70,217	28,700	41

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,549	600	18
Central	10,785	4.300	40
South	8,936	7,100	79
Penang	15,822	1,300	8
	39,092	13,300	34

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	20,115	800	4
	20,115	800	4

The percentage of areas out of tapping in June, 1938, was as follows:—Perak 38, Selangor 42, Negri Sembilan 63, Pahang 21, Malacca 28, Penang and Province Wellesley 32, Singapore 2, Johore 26, Kedah 29.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

1/20th acre of rubber trees. On receipt of their certificates, many small holders disposed of them to rubber dealers at prices ranging from 60 cents to $1.30 per share. The price then dropped but of late shows a tendency to rise.

Despite the widespread disposal of share certificates, small holders in many areas are engaged in using their shares to increase their area under this crop. In Selangor and Pahang there has been enquiry for available land for rubber planting, and in the latter State a number of Malays are purchasing share certificates from dealers, for it appears that on issue they were not very clear as to the nature of the certificates and sold them for as low a price as 60 cents per share; now the demand has increased, shares are changing hands at from 90 cents to $1.30 per share. In the more closely populated districts of Selangor shares were sold, and a large quantity of such rights is said to have been acquired by the larger estates owing reserve land.

Tapping.

There was some decrease in the area out of tapping on small holdings in Johore and Kedah, but an increase in all other States, so that at the end of the quarter it was estimated that 36 per cent. of the area of small holdings was out of tapping as compared with 33 per cent. at the end of the previous quarter. It must be remembered that in addition, many owners practice selective tapping, resting the less productive trees for an indefinite period. Many owners estimate that they can easily obtain sufficient rubber to cover their coupons by tapping for one month in the quarter.

Tables IV and V tabulate the results of the quarterly survey and provide a comparison with the previous quarter and last year.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	September 1937		June 1398		September 1938	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S. ...	96,100	16.0	239,300	39.9	274,800	45.9
S.S. ...	10,200	7.9	32,700	25.3	42,800	33.0
U.M.S. ...	42,800	7.9	147,600	27.6	137,600	25.7
MALAYA ...	149,100	11.7	419,600	33.2	455,200	36.0

Diseases.

The dry weather experienced during the quarter checked the incidence of Mouldy Rot disease (*Ceratostomella fimbriata*), although the wetter weather during September caused the disease to become more evident in some districts. Small holders usually appreciate the seriousness of allowing the disease to spread unchecked and the use of approved fungicides has found extended use in most parts of the country. In most villages, certain shops now stock one or more of the "white list" fungicides.

Pink Disease (*Corticium salmonicolor*) was reported to be spreading in one District of Perak on holdings with absentee owners.

Root diseases are almost invariably neglected. "White ant" control, however, is reported to receive more attention than formerly, and in one State the destruction of giant snails by the use of "Meta" has proved popular.

Economic Position of Small-Holders.

There has been little improvement in the economic position of small holders. The rise in the price of the product has tended to improve their position, but this has been largely offset by the low assessment, low quota and stationary position of the price for uncouponed rubber. The sale of new planting rights placed in their hands a little extra money, but generally speaking, owing to their lack of capital they have been unable to reap any lasting benefit from this right of planting, or from the higher prices of rubber prevailing in September.

Miscellaneous.

THE PRESERVATION OF CITRUS FRUIT JUICES.*

There is an appreciable trade in the United Kingdom in the so-called citrus squashes and cordials, which are not, however, natural fruit juices, but juices which have undergone some form of manufacturing or preservative treatment. In the United States of America, and to a lesser extent in certain European countries, there is a considerable trade in fruit juices which are preserved in such a way as to retain unaltered the characteristics of a fresh fruit juice. At present, however, the public in the United Kingdom has not learned to differentiate between the orange and lemon squashes which are currently sold and fresh fruit juice.

Orange, lemon, grapefruit and lime squashes and cordials as sold in England are prepared from the juice imported, usually in chestnut-wood casks which are not infrequently specially lined. Lemon and lime juices containing relatively high percentages of citric acid are frequently imported without addition, but orange juice with a lower citric acid and higher sugar content is liable to undergo fermentation during transit and is therefore treated with a preservative, usually sulphur dioxide which is added in the form of potassium metabisulphite to the extent of 700 or 800 parts of sulphur dioxide per million. These juices are diluted to about one-third their original concentration, usually by means of a syrup containing 45 per cent. by weight of sugar; acetic acid may be added, also sometimes a flavouring, while the deep orange colour of orange squashes is obtained by adding colouring matter, usually carotene. In the squashes the pectin remains in the juice, while for clear cordials the pectin is allowed to settle and the clear supernatant juice racked off, or is obtained by filtration.

Preservation of Juices in a Fresh Condition.

Five methods have been evolved for the preservation of fruit juices without the addition of preservatives; they are:—

(*a*) Preservation of fresh fruit juice by simple storage at low temperature.
(*b*) Preservation of fruit juices by "flash pasteurisation" and canning of the product.
(*c*) Concentration of fruit juices by film evaporation under reduced pressure.
(*d*) Concentration of fruit juices by freezing.
(*e*) Treatment of fruit juices by the "Matzka" process.

Preservation of Orange Juice by Storage at Low Temperatures.

The juice is extracted either from the whole fruit by means of a high speed reamer or by a cup type press or a whirl type press, using peeled fruit. After

* Abstract of an article by H. A. Tempany, C.B.E., D.SC., F.I.C., Assistant Agricultural Adviser to the Colonial Office, and late Adviser on Agriculture, Malay States, published in the *Bulletin of the Imperial Institute*, Vol. XXXVI, No. 3, July-September 1938.

extraction the juice is run through a strainer and thence to an evacuating apparatus which removes contained air. Thereafter it is transferred direct to the containers and is stored in refrigerated rooms at temperatures which range from 32° to 42°F. It has been found that flavour and appearance are considerably affected by the methods of extraction and it is necessary to avoid the inclusion of too much essential oil and also bitter principles from the skin. The de-aeration treatment is also very important as this affects the keeping qualities of the juice. If de-aeration is omitted juices are liable to darken in colour and go off in flavour as the result of oxidation.

Preservation of Fruit Juices by Flash Pasteurisation and Canning.

The flash pasteurisation method for preserving fruit juices consists essentially in raising the temperature to 185° to 190°F. and maintaining it at that for about ten seconds; treatment in this way gives results comparable to heating to 160°F. for 30 minutes. The advantage of this method as opposed to ordinary pasteurisation is that as the juice is exposed to the high temperature for a very short period the development of the cooked flavour, which is an undesirable concomitant of heat treatment, is avoided.

As in the case of the preservation of fresh juices by cold storage the pasteurisation process must also be accompanied by de-aeration if successful results are to be obtained. It is also usual to combine with them treatment of the juice with a pectin destroying enzyme which enables the opacity of the juice to be controlled without affecting the flavour to the extent that would occur if the pectinous constituents were removed by filtration. Various enzymes of this nature are now marketed by a number of firms under different names. The enzyme is added to the juice after extraction and before de-aeration and pasteurisation, which have the effect of destroying the enzyme, and sufficient interval is allowed to enable the enzyme to perform its functions before the subsequent processes are proceeded with.

In the production of pasteurised citrus juices very careful selection of the fruit is essential and all damaged and partially decayed fruit must be rigorously excluded. The methods of extraction are liable to affect, as with cold stored juice, the flavour unfavourably. A method extensively employed is to halve the fruit mechanically and to hand-spindle the half sections over revolving burrs. Attempts have been made to crush the whole fruit in its natural state, but this method has been discontinued on account of the strong flavour imparted to the extract by the oil contained in the skin. This flavour is regarded as objectionable.

An outline is given below of a method of preparing the juice employed at an American factory which embodies the Stero-Vac process of flash pasteurisation which is claimed to be one of the most efficient for producing this type of product.

The fruit is first grated to remove the oil and then pressed whole, the juice being strained to remove seeds and pulp. The grater consists of two horizontal revolving discs about 4 ft. in diameter, covered with a stainless steel fillet, which rotate at a speed of about 100 r.p.m. and revolve in opposite directions. The fruit is thrown by centrifugal action against the fillet, which punctures the oil

cells. The fruit leaves the outside of the first revolving disc and is transferred to the second disc where the grating is continued. At the centre it drops into a continuous press consisting of two discs of stainless steel about three feet in diameter, which revolve in the same direction and come together for a short distance on one side. The whole fruit rolls from the grater into one side of this, is crushed and the juice extracted. After pressing, the crushed peel is lifted off the disc and the juice flows into a stainless steel trough which surrounds the lower disc. It then flows to a finisher which is a mechanical strainer of stainless steel. From the finisher the juice flows to the de-aeration unit which consists of a steam chest with a separating chamber and a condenser, all constructed from stainless steel. Juice flows through the pipes of the steam chest—which are surrounded by hot vapour—under a high vacuum of about 28 inches Juice flows continuously from the extractors through the finisher and the de-aerating unit and is pumped out by a stainless steel vacuum pump to the can filler, which is so constructed that the juice may be broken to atmospheric pressure in an inert gas such as nitrogen.

For packing grape fruit juice plain tin cans are used, but with orange juice lacquered cans are employed in order to avoid flavour changes. After filling the juice in the cans. it is flash pasteurised by the Stero-Vac process. This process involves heating by steam injection through a patented valve in the end of each can and is performed on a specially designed machine. As the can is removed from the machine the disc in the valve is snapped into place as the result of the change in pressure; it is subsequently sealed by clinching and the cans rapidly cooled. The essential features of the process are quick heating and quick cooling combined with the removal of dissolved air.

Concentration of Fruit Juices in Vacuo.

There has been a not inconsiderable development of the concentration of fruit juices in vacuo in recent years. The principle employed is that of film evaporation which has been commercially developed in a variety of industries in the Kestner type of evaporators. The advantage of the process is that as evaporation takes place from the surface of a thin film it proceeds very rapidly while the high vacuum under which it is performed permits of the employment of a relatively low temperature.

In this way, as in the flash pasteurisation process, it becomes possible to avoid the occurrence in fruit juices concentrated by means of it of the cooked flavour, which is objectionable.

In the process as applied to fruit juices it has been found necessary to make special provision for retaining certain volatile substances which affect the flavour of the finished product and which are removed during the course of evaporation. This is accomplished by the incorporation in the plant of a special device whereby these substances are trapped and condensed, thus permitting of their re-addition to the finished product.

In operation it is understood that after extraction of the juice some of the pulp may be removed by filtration or by treatment with enzyme in order to obtain a product that is not too viscous and difficult to handle. Such concentrated juices contain about 60 to 70 per cent. total solid matter and it is stated that they can be kept without change at ordinary amospheric temperature indefinitely. It is understood that the preparation of pure concentrated orange juice by the process is sometimes difficult by reason of the low acidity which affects the keeping properties and that a trade is in consequence springing up in mixtures of concentrated orange and lemon juices, the higher acidity of the lemon juice enhancing the keeping powers of the mixture.

The Concentration of Fruit Juices by the Method of Freezing.

This process depends on the application of the well-known principle that when a solution is cooled below the freezing point of water separation into two phases occurs, a solid phase consisting of pure ice crystals and a liquid phase consisting of the original solution in a more concentrated condition. Theoretically, therefore, it is possible to effect concentration to any desired degree by freezing the solution and then separating out the ice- crystals. The process has seen its most important commercial development in Germany, under the title of the Krause Process.

The process in its present form consists in double or treble freezing in a stationary condition, transferring the ice block to a centrifugal, removing the mother liquor by whizzing, and subsequently concentrating the mother liquor by the same means.

The juice is frozen in a special vessel of such a shape and size that the moulded block of frozen material exactly fits the centrifuge employed, the general shape of the juice space is an annular ring which tapers slightly from top to bottom. The vessel is immersed in a brine tank and the brine circulates outside and inside the ring of the container thus ensuring that the temperature gradient is horizontal, which causes the ice crystals to grow along this gradient and so facilitates the separation of the concentrate.

A framework is immersed in the liquid to be concentrated, which provides a means of handling the frozen block and helps to prevent the frozen mass from disintegrating. The remainder of the plant consists of the brine tanks in which the brine is specially circulated for freezing, a second brine tank in which after a certain period of freezing the cell is allowed to "temper" (whereby the temperature of the frozen mass becomes even throughout) and the centrifuge which is provided with a central pipe entering the bowl for the introduction of liquids to wash the ice mass. The whole plant is made of corrosion resistant alloys.

Two brine tanks are provided for freezing and one for tempering, there is one centrifuge, and auxiliary apparatus comprises refrigerating plant and thermostats with storage tanks.

In operation a cell is filled with juice and placed in the first freezing tank for an hour, it is then removed and placed in the tempering tank for an hour, which levels out the temperature throughout the mass. The cell is then plunged into

warm water and immediately the content is free it is lifted on its frame, placed in the centrifuge and spun until concentrate ceases to issue from the discharge pipe. The mass is then washed with original juice and then with ice water from previously discarded ice. The washings are used again and again until the solid content has been raised nearly to the level of the first concentrate. They are then added to the bulk. ...

The process on the second and third concentrations is similar, save that lower temperatures are employed, while the ice from the last concentration is not washed but is added as it is to the original juice.

A cell is filled every twelve minutes and put to freeze; during the interval cells due for centrifuging have to be handled; ice removed from the bowl at the end of washing, transfers made from freezing to tempering tanks, and filling of second and third concentration cells made. The work is stated to be capable of being carried out by four men.

It is stated that the juices produced are excellent in flavour, but to ensure their keeping it is required that the soluble solids-contents be raised to 60-65 per cent. by the addition of sugar.With this they will keep well for six months at a temperature of 50°C. This is not in complete accord with earlier claims reported for juices concentrated by this process. It is also stated that the removal of pectin from concentrated juice by the use of pectin destroying enzymes has been proposed, but it is not clear whether this is as yet actually incorporated in the process.

The Matzka Process.

The process seems to depend upon a combination of low temperature flash pasteurisation and metallic silver sterilisation, the liquid being passed in thin layers between two heated metal surfaces. The temperatures attained by the juices are, however, lower than those usually considered necessary for pasteurisation, actually temperatures of from 130—140°F. are employed, and the sterilising action is claimed to depend on the so-called oligodynamic action of the metal with which it is in contact. Moreover, the two metal surfaces are different and electrically insulated from one another so that some electrolytic action is supposed to take place. A certain amount of the metals goes into solution, and the possible effect of this on human health has been questioned.[1]

In its simplest form the apparatus consists of two concentric tubes, the inner one being of silver and the outer of stainless steel; heat can be applied to the inner surface of the inner tube and the outer surface of the outer tube while the juice under treatment flows through the space between the two tubes. Juice intended for treatment requires to be de-aerated as in ordinary flash pasteurisation, and may be treated with an enzyme or filtered to clarify it. After treatment, the juice is filled direct into bottles with suitable arrangements for sterilising them so as to prevent after-infection.

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[1] In the opinion of the Ministry of Health the presence of small quantities of silver in juices treated by this process might be regarded as a contravention of the Public Health (Preservatives, etc., in Food) Regulations.

Various juices were treated experimentally in the Ontario trials and uniformly satisfactory results were reported. Among the juices treated were orange juice and grapefruit juice, and it is claimed that the products, as well as keeping satisfactorily, compared very favourably with commercial samples of similar juices which had been prepared by the ordinary flash pasteurisation process.

Commercial plants are stated to be operating in Holland, Sicily, Spain, the U.S.A. and Canada. It is stated that the National Research Council of Canada were satisfied that juices processed by this method had a superior and more natural flavour than any other processed fruit sampled.

Conclusion.

It is not altogether clear which of the processes of preserving citrus juices described offers the greatest prospect of success, i.e. (a) extraction of fresh fruit juice, its de-aeration and preservation by cold storage for short periods, (b) the preservation of fruit juice by flash pasteurisation and de-aeration followed by subsequent canning, (c) concentration of juice in vacuo by a film evaporation process, (d) concentration by freezing on the lines of the Krause process, or (e) preservation by the Matzka process.

The Krause process of concentration by freezing is thought by some to offer the best prospects in the long run. On the other hand, if the Matzka process fulfils its present promise it also seems to hold out possibilities, but the objection to this process by reason of the presence in the treated juice of small quantities of silver must not be overlooked.

The Department of Scientific and Industrial Research have pointed out that there is no possibility of patenting the actual process of concentration by freezing *per se*. The only points over which patent rights can extend are the details of the apparatus employed.

In conclusion, it may be pointed out that while the foregoing information applies in the first instance to the preservation of citrus fruit juices it also has a direct bearing on the preservation of juices of other kinds of fruit. In the Colonial Dependencies interest in this connection at present attaches particularly to the preservation of pineapple juice in Malaya and certain other Dependencies and to passion fruit juice in Kenya; consequently, although the application of the data given lies in the first place in those Dependencies in which citrus fruit is grown, it also has an interest for a number of others.

Review.

Report of the Poultry Technical Committee of Great Britain.

Published by H.M. Stationery Office, London 1938.

76 pp. Price 1 shilling net.

This Report is of more than passing interest to poultry keepers throughout the Empire and to those concerned with poultry improvement schemes by reason of the fact that breeders habitually procure their pedigree breeding stock from the United Kingdom and rely on the stamina of this stock to withstand and more trying conditions of their new environment. It comes somewhat as a shock, therefore, to read in this report of the great mortality of poultry experienced in Great Britain due to low vitality and stamina.

The reason for this unsatisfactory position is due in large measure to the rapid development of the industry in post-war years, the emphasis laid on egg numbers rather than stamina, and to certain unsatisfactory methods of marketing breeding stock. In other words, the high quality of the breeding stock has not been maintained in face of the expansion of the industry.

In consequence, the incidence of mortality has assumed serious proportions—the annual loss from disease is estimated to exceed £4,000,000 for adult laying birds in England and Wales alone.

The Committee recommends that steps be taken to stop the distribution of diseased and debilitated stock, the building up of good foundation stock, and closer control of breeding and sale of breeding poultry. These recommendations entail a considerable expansion in research work. The adoption of the recommendations will go far to restore confidence in the industry, but in any case it will take some time before the damage done can be eradicated and any considerable improvement effected in the position. In the meantime, poultry keepers in Malaya may feel themselves in a quandary as to where to obtain guaranteed good stock. The reviewer suggests that those who wish to import satisfactory stock from Great Britain should write to the Ministry of Agriculture in London, stating their requirements, and asking to be recommended to a source from which they can confidently rely on the high quality and stamina of stock. They may be assured that the Ministry is in a position to supply this information, and the result should therefore ensure that they are paying for stock with the desired characteristics.

D. H. G.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

October, 1938.

The Weather.

The weather generally has been dry. In Kedah and Penang although the rainfall was ample and well distributed the amount recorded was well below the averages of previous years. Throughout the west coast area the first half of the month was very dry but later the weather broke and good falls of rain were experienced in the latter two weeks. South Johore proved exceptional to this, for the rainfall there was normal.

For the last two months Pahang has experienced the rigours of a drought. On the east coast water supplies have everywhere been curtailed, and the condition of crops caused much anxiety. The dry weather continued into October, but showers of rain, which occurred in the last few days of the month, have helped to ameliorate conditions.

In Kelantan the month's rainfall was also below average, but was sufficient and evenly distributed.

Crop Reports.

Rubber.—The price of rubber has steadily appreciated, and reached a maximum of $37 per picul for best quality smoked sheet at the end of October. The price of coupons also reached a value of $30 per picul equivalent. Despite this increase of price there has been no greater activity among owners of rubber holdings. Those who employ labour to tap now definitely find that it pays them to sell their coupons and rest their trees. In Province Wellesley this state of affairs has become so general that there is now serious unemployment among Malays.

A report to the effect that the Kedah Government had decided that no new alienation of land should be made for planting rubber has caused much disappointment among people, there and in the Colony, who had been buying share certificates in the expectation of being allowed to plant new land. The value of share certificates has accordingly slumped to 80 cents. In other parts of the country the brisk trade in these certificates continues and the value is about $1 to $1.20 each.

In Kelantan dealers are paying a good premium for well prepared smoked sheet, and as much as $3.75 extra is being received. This is proving more effective than propaganda, and several smoke cabinets are being constructed.

Padi.—The floods which occurred in Kedah during September have caused serious damage. At Kubang Pasu in North Kedah 1,400 acres were destroyed. Fortunately there remained a fair quantity of surplus seedlings in nurseries in

neighbouring districts and these were brought to Kubang Pasu to replant the devastated areas. It is hoped that ultimately not more than 140 to 200 acres of the area destroyed will be left unplanted. The Kuala Muda District remained unscathed.

In the recently opened extension to the Sungei Acheh padi area, there has been some shortage of water, which has resulted in the plants being damaged by rats.

In Pahang, owing to the drought, the plight of padi planters in some areas has been desperate. In the Raub District some of the rice fields have been cultivated three times, but only after the recent showers is transplanting being attempted. Nurseries have also been sown two or even three times.

Despite these difficulties and misfortunes this season's crop in most parts of the country looks promising and, provided weather conditions are favourable, a fair yield is expected. The Agricultural Officer, Penang, reports that some areas on the Island now look so promising that the yields may well break records.

Coconuts.—Business in the copra market is very slack and not much of this commodity is being made. Owing to the fasting month the market for fresh nuts for eating is good and this is proving of financial benefit to small-holders.

Pineapples.—The scheme for the formation of a Central Board of Pineapple Packers was brought into operation during the month. Owners of unregistered factories who are also members of the Scheme are showing increased activity in carrying out renovations. The authorities are insisting upon strict compliance with hygienic requirements.

The basic price of canned pineapples was fixed by the Board at $3.10 per case of 48 cans of standard quality. Golden quality fruit is selling at $3.35 per case. Should this price be maintained it is expected that further attention will be given by canners to an increased output of this grade.

For the protection of their interests the formation of an association of growers, which has been decided upon, is proceeding.

Bananas.—In Negri Sembilan propaganda to induce banana growers to plant cover crops on their holdings has been continued, and some 20,000 cuttings of ***Mikania scandens*** have been distributed. Occupiers of 658 acres of banana land have now commenced to plant this cover. Among these growers it is a tenet that bananas must be clean-weeded; hence it is proving very difficult to induce them to carry out this measure which is very necessary for the prevention of soil erosion.

DEPARTMENTAL NOTES

Activities at the School of Agriculture, Malaya.

The second school term ended on 21st October.

The Commission appointed to report on higher education in Malaya visited the School on 7th November and conferred with the acting Adviser on Agriculture and the Principal of the School.

The third issue of the School Magazine has been published. It is attractively produced and contains some excellent articles and illustrations. The Editor and contributors are to be congratulated on the production of this publication which should serve as a valuable link between the School and the Old Boys.

School Gardens.

In many States, school garden competitions reached the final judging stage in October, the task of judging being shared by Agricultural Officers and officers of the Education Department. Schools have since closed for the "Bulan Puasa" holidays, and, unfortunately, many of the gardens will deteriorate before the pupils return.

Rural Lecture Caravan.

The Rural Lecture Caravan outfit visited 6 centres in the Sabak Bernam sub-District of Selangor during October, 2 days being spent at each centre. The subjects dealt with in agricultural lectures were copra, padi, poultry and plant propagation.

During the present year, the equipment has been operated from a lorry, as the caravan met with an irreparable accident early in January of this year. Arrangements have been made by the Propaganda and Marketing Committee for the provision and a new Lecture Caravan, to be operated by the Department of Agriculture, the Co-operative Department and the Rubber Research Institute of Malaya. It is anticipated that the new Caravan will be ready for use early in January 1939.

Leave.

Mr. J. Cook, Agricultural Officer, has been granted 245 days leave from 21st October 1938 to 26th June 1939 both days inclusive.

Mr. V. Dawson, Vice-Principal, School of Agriculture, has been granted 213 days leave from 5th November 1938 to 5th June 1939 both days inclusive.

Mr. R. G. H. Wilshaw, Chemist (Soils), has been granted 197 days leave from 13th August 1938 to 25th February 1938 both days inclusive, and not as previously stated, 274 days leave from 13th August.

Return to Duty.

Mr. C. L. Newman, Agricultural Officer, has assumed duty in the post of State Agricultural Officer, Selangor, on return from Sarawak where he was temporarily seconded for duty, with effect from 12th October, 1938, inclusive.

FERTILIZER PRICES, OCTOBER, 1938.

The following are the prices at the end of October, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40 00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

Statistical.

MARKET PRICES.

October, 1938.

Major Crops.

Rubber.—The Singapore price of No. 1. X Rubber Smoked Sheet, loose, varied between 27¾ and 29¼ cents per lb., the average price for the month being 28.70 cents per lb., as compared with 26.21 cents per lb. in September. The highest and lowest London quotations were 8½ and 8⅛d. per lb., and New York 17⅛ and 16½ cents gold per lb. Average prices per lb. in London and New York respectively were 8.36d. and 16.83 cents gold as compared with 7.92d. and 16.04 cents gold respectively in September.

Prices paid for small-holders' rubber at three centres during October are shewn in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, October, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan				Kuala Kangsar, Perak			Batu Pahat, Johore.			
	6	13	20	27	5	12	19	5	12	19	26
Smoked Sheet	35.50	37.00	36.00	—	32.00	36.70	33.00	—	33.20	34.43	—
Unsmoked Sheet	34.00	35.00	35.00	34.00	—	—	—	33.30	32.58	33.54	32.28
Scrap	No purchases										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases of rubber at Kuala Kangsar on 26th October.

Palm Oil.—Prices remained steady throughout the month. The average of weekly quotations per ton in September were:— palm oil £12.15.0, kernels £8.5.7½; prices for October are shewn in the following table:—

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c i f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
October 7	£ 13. 0. 0 Canada	£ 8. 3. 9 Rotterdam
,, 14	13. 0 0 ,,	8. 3. 9 Continent
,, 21	13. 0. 0 ,,	8. 3. 9 ,,
,, 28	13. 0. 0 Liverpool	8. 5. 0 Rotterdam
Average	£ 13. 0. 0	£ 8. 4. 1

Copra.—Prices continued at a low level with a tendency to drop still lower. The average Singapore prices in October were as follows:— Sundried $3.12 and Mixed $2.78 per picul, as compared with $3.25 and $2.93 per picul respectively in September.

Copra cake remained steady at $2.05 per picul.

Rice.—The average Singapore wholesale market prices of rice per picul in September were as follows:— Siam No. 2 ordinary $4.46, Rangoon No. 1 $3.85, Saigon No. 1 $4.10, as compared with $4.34, $3.82 and $4.05 in August and $4.57, $3.92 and $4.12 in September 1937.

The average retail prices in cents per gantang were Singapore 29, Penang 35, Malacca 28.

The average declared trade value per picul of imports during September was $3.98, as compared with $4.00 in August and $4.20 in September 1937.

Padi.—Prices are generally higher in the main padi growing areas; in Kedah the price was per 100 gantangs $8.25 to $9, Penang $9.30, Perak North $11 to $12, Selangor $8.50 to $9, Malacca $9 to $10. Considerably higher prices rule in Districts more remote from centres of production.

The Government Rice Mill in Krian paid $2.30 per picul for padi. Other millers then raised their price to $2.45 to secure supplies which otherwise would have been diverted to the Government Mill.

Pineapples.—The Pineapple Packers' Agreement came into force on October 15th, and on 17th all Singapore factories closed down for stocktaking. Prices are still nominal. For G.A.Q. Spiral cut $3.10, Round cut $3.75, Cube $3.00 per case of 48 tins of 1½ lbs. each. Golden quality, Spiral $3.35, Round cut $4, Cube $3.25.

One factory in Selangor and 3 in Johore re-commenced working on limited supplies of fruit. In Selangor fresh fruit was from 70 to 80 cents per 100, Johore North, 1st quality $3, 2nd $2, and 3rd $1. In South Johore fresh fruit per 100 was 1st. $1 to $1.40, 2nd. 70 cents to $1, 3rd 40 to 70 cents. Singapore prices ranged per 100 from $1.20 to $1.70.

Beverages.

Tea.—Seven consignments of lowland tea comprising 454 packages were sold on the London market during October at an average price of 1s. 0d. per lb., in addition to 5 consignments (494 packages) of upland tea, which sold at an average of 1s. 2.15d. per lb.

According to the *Tea Brokers' Association of London Report* for October, the average London price per lb. realized during the month for consignments of tea from other countries were as follows:— Ceylon 1s. 3.18d., Java 1s. 4.20d., Indian Northern 1s. 2.58d., Indian Southern 1s. 1.47d., Sumatra 1s. 0.05d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 25th October 1938, of the Ceylon Brokers' Association, are as follows, in rupee cents per lb.:— High Grown Teas 75, Medium Grown Teas 66, Low Grown Teas 62.

Coffee.—Sourabaya coffee prices in Singapore were steady at between $10.25 and $9.00 per picul, the price within this range depending on quality, while Palembang coffee prices averaged $12.44 to $10.89 per picul.

Liberian coffee appreciated to $14.75 per picul, the average price for the month being $14.69, Excelsa rose to $9.25, the average price being $9.19, and Robusta to $6.25, the average price being $6.19 per picul.

Spices.

Arecanuts.—The average of highest and lowest market prices in Singapore during October were as follows:— Splits $8.39 to $5.00, Red Whole $6.63 to $4.50, Sliced $11.52 to $8.37 as compared with $7.30 to $4.85, $6.68 to $5.19 and $8.80 to $7.10 respectively in September. The price within these ranges depends on quality.

The average of Singapore Chamber of Commerce quotations per picul were Best $8.19, Medium $7.75, Mixed $6.75 as compared with $8.15, $7.70 and $6.90 per picul in September.

Pepper.—Market featureless. Average Singapore prices per picul in October were:— Black $8.03, White $12.19, Muntok $12.70, as compared with $8.01, $12.45 and $12.70 in September.

Nutmegs.—Singapore prices declined steadily throughout the month. Both 110's and 80's were quoted at the same price, and averaged $29.50 per picul as compared with $30.60 per picul in the previous month. The Penang market price was $20 per picul.

Mace.—Singapore quotations for Siouw were $80 per picul, a nominal price. Amboina dropped $2 per picul, to average $61.50 per picul. Average prices in September were $80 and $62 per picul respectively. In Penang mace was quoted at $85 per picul.

Cloves.—Nominal prices for both Zanzibar and Amboina cloves were quoted in Singapore at $40 per picul. The Penang price was $42 per picul.

Cardamoms.—The latest available price for green cardamoms as given in *The Ceylon Chamber of Commerce Weekly Report* for 24th October 1938, was from 85 cents to Rs.1.15 per lb.

Miscellaneous.

Derris.—The position of the Singapore derris market, as reported last month, is unchanged, but prices have further declined. Average prices in October were:—for root sold on basis of ether extract $11 to $13 per picul, root sold on basis of rotenone content $18 to $20 per picul.

Our New York correspondent, writing on October 11th, reports that the market price for derris 5 to 6 per cent. rotenone is 5¾ to 6d. per lb. *c.i.f.* New York, based on landed weights and New York analysis on arrival. The premium for higher type root is about ½d. per unit of rotenone content, but this is dependent on the percentage of total ether extractives. Cube root with a guaranteed 5 per cent. minimum rotenone content is fetching 8½ cents (gold), or approximately 4½d. Cube root, however, is liable to royalties under the Derris Patent which brings the cost to approximately 9⅝ cents *c.i.f.* New York. It begins to appear that a greater proportion of derris root will be used this coming season as the price advantage of cube has shrunk markedly since last season and in some quarters derris dusts are preferred to cube. Generally speaking, however, the farmers regard them on a par.

Gambier.—Block gambier was quoted in Singapore at $7.00 per picul (nominal); Cube No. 1 $15 per picul, as compared with $7.25, and $15 respectively in September.

Tapioca.—Singapore prices have not moved from those reported for September, *viz.*: Flake Fair $4.10, Seed Pearl $3.90, Medium Pearl $4.50 per picul.

Sago.—Pearl sago was quoted in Singapore throughout October at $3.85 per picul, as compared with an average of $3.18 per picul in September. Flour Sarawak Fair dropped slightly to average $2.26 per picul, as compared with $2.29 in September.

Tobacco.—Prices continue to vary considerably from District to District. In the more important centres of production prices were generally higher. Uncured leaf was around $3 per picul. Prepared tobacco, Grade I, $31 to $45 per picul, Grade II $24 to $40, Grade III $11 to $30 per picul. Kelantan prices remain very much higher than the above quotations, while Johore prices continue discrimination between Javanese and Chinese tobacco, the latter fetching higher prices than the former.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note:—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

IMPORTATION OF FRESH FRUIT INTO CEYLON.

Representations were made to the Government of Ceylon asking that a licence may be issued in the form of a general authority to import fresh fruit from the Straits Settlements and Federated Malay States in view of the fact that the Mediterranean Fruit Fly does not occur in Malaya.

In reply, the Ceylon Government replied to the effect that licences to import fresh fruit are issued by the Director of Agriculture to importing firms and agencies on request, subject to the conditions laid down in the regulations. It will be necessary, therefore, for firms or agencies in Ceylon wishing to import fresh fruit from Malaya to apply for licences. In view of the fact that the Mediterranean Fruit Fly does not occur in Malaya, licences will be issued on receipt of applications.

The exports of fresh fruit from Malaya to Ceylon are very small—in 1937 they amounted to just over one ton, valued at $405, mostly mangosteens and rambutans—but in view of the fact that from time to time there is an excess of these fruits in the Penang market, this outlet for Malayan fruit is well worth consideration.

GENERAL RICE SUMMARY.*

September, 1938.

Malaya.—The imports of foreign rice during September were 68,891 tons,† exports were 18,876 tons, net imports being 50,015 tons as compared with 65,211 tons in August 1938 and 70,682 tons in 1937.¶

Of the September 1938 imports, 49 per cent. were consigned to Singapore, 15 per cent. to Penang, 6 per cent. to Malacca, 20 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows, (in tons, percentages in brackets):—Siam 48,303 (70.1), Burma 17,192 (25.0), French Indo-China 2,294 (3.3), other countries 1,102 (1.6).

Gross imports for the first nine months of 1938 were 613,461 tons, exports were 145,567, net imports therefore being 467,894 tons.

Of exports during September, 82 per cent. were consigned to the Netherlands Indies and 18 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 14,410 (76.3), Burma 3,846 (20.4), French Indo-China 548 (2.9), Parboiled 29 (0.2), Malayan 43 (0.2).

Net imports of rice during September by countries of origin were, in tons:—Siam 33,893, Burma 13,346, French Indo-China 1,746, elsewhere 1,030.

India and Burma.—Foreign exports January to August were 183,000 tons as compared with 625,000 tons in 1937, a decrease of 70.7 per cent. Of these 2.7 (4.2) per cent. were to the United Kingdom, 4.4 (6.1) per cent. to the Continent of Europe, 38.3 (28.0) per cent. to Ceylon, 4.9 (22.4) per cent. to the Straits Settlements and the Far East, and 49.7 (39.3) per cent. to other countries. The figures in brackets are for the same period of 1937.

Foreign exports from Burma from 1st January to 21st September 1938 were 2,512,613 tons as compared with 2,654,169 in 1937 a decrease of 5.3 per cent. Of the 1938 exports 41.0 (44.8) per cent. were to India, 10.1 (8.9) per cent. to the United Kingdom, 8.6 (11.1) per cent. to the Continent of Europe, 11.8 (10.9) per cent. to Ceylon, 14.2 (13.3) per cent. to the Straits Settlements and the Far East, and 14.3 (11.0) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

The average prices in rupee cents per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 219, Small Mills Specials 232.

Siam.—Exports of rice and rice products from Bangkok during July were 112,496 tons. For the first seven months of 1938 exports were 931,205 tons as compared with 569,268 tons in 1937.

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* Abridged from the Rice Summary for September, 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

According to a statement dated 30th September, 1938, received from His Majesty's Consul at Bangkok, relating to the final report on the rice crop of Siam for the season 1937-38, the cultivated area totals 8,424,948 acres, as compared with 8,145,440 acres of last season's crop. An increase of 279,508 acres in rice cultivation is shewn. About 1,066,474 acres are given as damaged area, as against 2,580,080 acres of that of the previous season. The harvested area is reported at 7,358,473 acres with an outturn of about 4,519,549 tons of paddy while the outturn of last season's crop was only 3,353,032 tons.

As a whole the present crop is much better than last season's crop, which, due to unfavourable weather conditions, was very much below normal. But if comparison is to be made of the present crop with some of the previous crops, the result could not be considered more than satisfactory.

As a comparison, statistics on rice crops from the season 1932-33 to the season 1936-37 are given below:—

Season	Area Planted Acres	Area Damaged Acres	Harvested Area Acres	Yields Tons
1932 - 33 ...	8,034,476	505,964	7,528,512	5,075,798
1933 - 34 ...	8,113,276	577,956	7,535,320	4,967,988
1934 - 35 ...	8,341,737	1,009,672	7,332,065	4,561,295
1935 - 36 ...	8,444,247	1,016,904	7,427,343	4,689,467
1936 - 37 ...	8,145,440	2,580,080	5,565,360	3,353,032
(Average				
1932 - 36) ...	8,215,835	1,138,115	7,077,720	4,529,516
1937 - 38 ...	8,424,948	1,066,474	7,358,473	4,519,549

Japan.—The rice consumption in Japan (*Trans-Pacific Journal,* 22nd September, 1938) for the first 10 months of the present rice year, November-August, amounted to 9,823,282 tons, representing an increase of 145,021 tons over the corresponding period of the preceding rice year.

Stocks of rice on 1st September amounted to 2,377,555 tons, gaining 99,286 tons, or 4 per cent. over the corresponding period of last year.

The present rice year ends on 31st October. During the last two months, the rice supply is estimated at 2,648,387 tons as against a demand for 1,424,404 tons. The balance to be carried forward to the next season will be 1,223,983 tons.

The supply and demand figures are as follows:—

Supply:	tons	Demand:	tons
September 1st stocks ...	2,378,000	Estimated consumption ...	1,409,000
Estimated imports from abroad ...	11,000	Estimated exports abroad	1,000
,, ,, from colonies	259,000	Estimated exports to colonies	14,000
	2,648,000		1,424,000
Balance ...	1,224,000		

French Indo-China.—Entries of padi into Cholon during the first nine months of 1938 were 882,865 tons, as compared with 1,212,222 tons in 1937, a decrease of 27.2 per cent. Exports of rice during the same period were 920,499 tons, as compared with 1,206,758 tons in 1937, a decrease of 23.7 per cent.

His Majesty's Consul at Saigon states that the rise in the price of rice was uninterrupted from the 1st ($3.39 per picul) to 25th ($3.68 per picul). The price declined by the end of the month to $3.63, but a recovery is expected. The price of padi rose concurrently; opening at $2.23 per picul, it stood at $2.32 on 15th, and closed at $2.42 per picul.

Netherlands Indies.—The latest information available was published in the Summary for August 1938.

Ceylon.—Imports of rice for the first nine months of 1938 amounted to 418,750 tons, as compared with 400,581 in 1937, an increase of 4.5 per cent. Of these imports, 17.9 (17.0) per cent. were from British India, 69.7 (69.6) per cent. from Burma, 0.2 (0.1) per cent. from the Straits Settlements, and 12.2 (13.3) per cent. from other countries. The figures in brackets are for the corresponding period of 1937.

Europe and America.—Shipments from the East to Europe for the period 1st January to 8th September were 998,434 tons as compared with 892,956 tons in 1937, an increase of 11.8 per cent. Of these 40.5 (45.2) per cent. were from Burma, 48.9 (48.2) per cent from Saigon, 9.3 (4.7) per cent. from Siam, and 1.3 (1.9) per cent. from Bengal. The figures in brackets are for the corresponding period of 1937.

Shipments to the Levant from 1st January to 25th August were 27,092 tons, as compared with 11,757 tons in 1937, an increase of 130.4 per cent.

Shipments for Cuba, West Indies and America from 1st January to 31st August were 144,225 tons, as compared with 191,444 tons in 1937, a decrease of 24.7 per cent.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Aug. 1937	Jan./Aug. 1938	August 1937	August 1938
Arecanuts ...	30,084	20,494	26,383	656	2,679
Coconuts fresh ...	95,223†	59,205†	68,525†	5,796†	7,472†
Coconut oil ...	39,762	25,407	28,815	4,013	4,185
Copra ...	75,592	40,520	28,267	2,767	2,823
Gambier, all kinds ...	1,955	1,304	1,104	171	234
Copra cake ...	15,026§	9,507§	4,628§	1,487§	745§
Palm kernels ...	7,312	4,104	5,412	645	570
Palm oil ...	42,787	28,168	35,645	5,785	6,368
Pineapples, canned ...	80,502	64,589	55,038	8,723	5,349
Rubber ...	503,127¶	320,845¶	257,736¶	48,383¶	26,754¶
Sago,—flake ...	15,478	5,527	352	942	321*
,, —pearl ...	3,759	2,126	2,761	389	443
,, —raw ...	8,256*	4,775*	3,557	816*	316*
Tapioca,—flake ...	1,058	1,130	631	65	117
,, —flour ...	2,393*	1,328*	2,243*	247*	69*
,, —pearl ...	18,786	11,609	12,843	1,577	1,834
Tuba root ...	573	439	336	46	52

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
July	2,546.5	2,134.2	450.8	311.0
August	3,587.4	2,798.1	587.8	437.0
September	3,415.9	1,779.2	591.4	289.0
Total ...	21,420.4	15,705.4	3,775.2	2,597.0
Total January to September, 1937 ...	19,973.5	13,439.5	3,547.4	2,176.4
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 30th September, 1938 were palm oil 1,885 tons, palm kernels 806 tons.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 30th September, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber not Tapped: Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Otherwise than under rotational systems: Percentage of (7) to (2)	Under rotational systems: Acreage	Under rotational systems: Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Area of Tappable Rubber never been tapped: Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,336	18,944	43.7	932	2.2	14,883	34.3	8,577	19.8	465	1.1	24,392	56.3
Malacca ...	121,610	55,778	45.9	3,847	3.1	32,095	26.4	29,890	24.6	1,678	1.4	65,832	54.1
Penang ...	2,488	1,187	47.7	nil	nil	1,241	49.9	60	2.4	18	0.7	1,301	52.3
Singapore ...	32,133	16,026	49.9	4,011	12.5	6,743	21.0	5,353	16.6	83	0.3	16,107	50.1
Total S.S. ...	199,567	91,935	46.1	8,790	4.4	54,962	27.5	43,880	22.0	2,244	1.1	107,632	53.9
F. M. S.—													
Perak ...	286,369	155,718	54.4	8,024	2.8	68,985	24.1	53,642	18.7	6,874	2.4	130,651	45.6
Selangor ...	323,234	194,122	60.1	7,074	2.2	58,037	17.9	64,001	19.8	6,704	2.1	129,112	39.9
Negri Sembilan ...	253,989	133,708	52.6	9,315	3.7	60,632	23.9	50,334	19.8	7,132	2.8	120,281	47.4
Pahang ...	86,290	45,967	53.3	3,613	4.2	26,137	30.3	10,573	12.2	6,269	7.3	40,323	46.7
Total F.M.S. ...	949,882	529,515	55.7	28,026	3.0	213,791	22.5	178,550	18.8	26,979	2.8	420,367	44.3
U. M. S.—													
Johore ...	475,605	269,709	56.7	18,150	3.8	120,421	25.3	67,325	14.2	32,138	6.8	205,896	43.3
Kedah ...	197,128	112,897	57.3	10,500	5.3	32,866	16.7	40,865	20.7	6,359	3.2	84,231	42.7
Kelantan ...	31,388	19,458	62.0	253	0.8	7,142	22.8	4,535	14.4	2,351	7.5	11,930	38.0
Trengganu (b) ...	4,817	3,182	66.1	nil	nil	74	1.5	1,561	32.4	74	1.5	1,635	33.9
Perlis (c) ...	1,371	621	45.3	262	19.1	354	25.8	134	9.8	75	5.5	750	54.7
Brunei ...	5,746	2,584	45.0	nil	nil	2,385	41.5	777	13.5	244	4.2	3,162	55.0
Total U.M.S. ...	716,055	408,451	57.0	29,165	4.1	163,242	22.8	115,197	16.1	41,241	5.8	307,604	43.0
Total Malaya ...	1,865,504	1,029,901	55.2	65,981	3.5	431,995	23.2	337,627	18.1	70,464	3.8	835,603	44.8

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7)
(b) Registered companies only
(c) Figures for the quarter ending 30th June, 1938

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF SEPTEMBER, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealers	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: Jan to Sept. 1938	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: Jan. to Sept. 1938	Imports: during the month: Foreign	Imports: during the month: From Malay States & Labuan	Imports: January to Sept. 1938: Foreign	Imports: January to Sept. 1938: From Malay States & Labuan	Exports including re-exports: during the month: Foreign	Exports including re-exports: during the month: Local	Exports including re-exports: January to Sept. 1938: Foreign	Exports including re-exports: January to Sept. 1938: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over	Consumption 3: during the month	Consumption 3: Jan. to Sept. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	7,008	18,053	10,177	99,317	2,826	44,241	Nil	Nil	Nil	Nil	10,663 8,270	2,348	109,036 106,643	32,490	...	6,384	21,043	19	145
Johore ...	.	2,954	7,555	4,409	45,156	2,137	26,638	Nil	55	Nil	251	2,311	2,977	26,490	43,367	...	3,074	8,748	...	...
Kedah ...	..	218	4,418	2,358	24,388	410	7,531	Nil	Nil	Nil	Nil	1,077	1,113	15,023	15,811	..	217	4,997	...	...
Perlis ...	...	25	26	10	112	12	187	Nil	Nil	Nil	Nil	Nil	24	Nil	275	.	19	30	...	...
Kelantan ...	...	767	514	340	3,250	452	5,375	Nil	Nil	Nil	Nil	323	358	2,498	5,821	...	739	653	...	...
Trengganu ...	..	55	50	101	2,207	55	1,108	Nil	Nil	Nil	Nil	5	151	5	3,310	...	55	50	...	...
Brunei ...	...	10	59	42	409	44	588	...	...	...	...	...	79	...	996	...	Nil	76	...	...
Total Malay States	...	11,037	30,675	17,437	174,839	5,936	85,668	Nil	55	Nil	251	14,379	7,050	153,052	102,070	...	10,488	35,597	19	145
S. SETTLEMENTS :—																				
Malacca ...	...	2,103	1,808	932	9,779	779	4,823	Nil		Nil		2,277		21,190		...	1,986	2,066	...	...
Province Wellesley	..	3,224	757	348	3,642	154	*1,859	Nil		Nil				65,571		...	2,463	884	...	...
Penang ...	1,134	6,392	8	16	160	78	733	2,539	7,278	22,299	105,295	6,453	Nil		Nil	1,802	5,087	10	...	...
Singapore ...	5,120	28,371	261	120	1,285	20	430	8,011		98,962		17,883		172,563		3,739	24,770	288	26	223
Labuan ...	..	49	Nil	Nil	Nil	11	106	36		415		Nil		Nil		...	33	Nil	...	...
Total Straits Settlements ...	6,254	40,139	2,834	1,416	14,856	1,042	7,951	10,586	7,278	121,676	105,295	26,613	Nil	259,324	Nil	5,541	34,339	3,248	26	223
Total Malaya ...	6,254	51,176	33,509	18,853	189,705	6,978	93,619	10,586	7,333	121,676	105,546	40,992	7,050	412,376	102,070	5,541	44,827	38,845	45	368

*Amended:—89 tons over reported in May and 154 tons in August.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	5,673	23,922	4,862	4,388	2,594	88
WET RUBBER	711	848	225	94	480	129
TOTAL ...	6,384	24,770	5,087	4,482	3,074	217

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1938
29	30	31
Singapore ...	28,534	275,459
Penang ...	8,624	96,293
Port Swettenham.	3,755	38,769
Malacca ...	79	1,855
MALAYA ...	40,992	412,376

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept. 1938
32	33	34
Malay States ...	18,927	252,145
Straits Settlements	1,425	21,597
MALAYA ...	20,352	273,742

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet. 15% wet sheet. 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves
4. Columns (33) and (34) represent exports of rubber subject to regulation which. for Singapore and Penang Islands are represented by sales or exports as shown by cess paid
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable
6. The above, with certain omissions, is the Report published by the acting Registrar-General of Statistics S.S and F.M.S. at Singapore on 25th October, 1938

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.3	72.0	80.7	93	69	84	76	83.6	84.5	7.41	188.2	2.43	16	11	4	7	—	165.00	5.50	45
Bukit Jeram, Selangor ...	89.1	72.6	80.9	92	71	84	76	84.2	86.1	4.41	112.0	1.56	12	11	—	—	—	188.40	6.28	52
Sitiawan, Perak ...	87.9	72.8	80.3	91	68	81	76	83.8	84.7	9.00	228 6	2.25	13	11	3	—	—	143.80	4.79	39
Ipoh Aerodrome, Perak ...	89.2	72.2	80.7	93	68	84	75	82.8	84.0	5.58	141.7	1.01	17	14	6	—	1	153.10	5.10	42
Temerloh, Pahang ...	90.2	71.9	81.1	94	66	84	74	85.6	86.8	5.58	141.7	2.20	16	11	1	14	—	163.05	5.43	45
Kuala Lipis, Pahang ...	89 3	71.4	80.3	92	69	84	74	84.2	85.2	4.26	108.2	2.00	10	7	—	24	—	161.90	5.40	45
Kuala Pahang, Pahang ...	87.6	74.2	80.9	90	69	84	77	86 8	88.2	4.66	118 4	1.93	10	7	5	—	—	192.75	6.43	53
Kallang Aerodrome, S'pore ...	85.6	76.3	80.9	89	72	79	81	82.3	83.5	6.29	159.8	3.01	19	13	6	—	—	138.90	4.63	38
Bayan Lepas Aerodrome Penang ...	85.8	73.9	79.9	88	71	83	76	83.3	84.4	9.36	237.7	1.68	22	18	2	—	2	161.25	5.37	45
Malacca Town, Malacca ...	85.0	74.0	79.5	89	71	82	77	83.5	84.4	5.02	127.5	1.25	15	11	4	—	3	155.75	5.19	43
Kluang, Johore ...	87.5	71.3	79.4	91	66	80	73	81.3	82.2	7.55	191.8	1.44	15	14	6	11	—	127.25	4.24	35
Mersing, Johore ...	89.0	72.0	79.5	92	67	79	75	82.1	82.5	4.72	119.9	2.20	14	10	1	—	1	163.35	5.45	45
Alor Star, Kedah ...	86.3	73.7	80.0	90	72	80	76	84.2	85.2	13.62	345.9	2.61	21	18	2	—	—	146.90	4.90	40
Kota Bahru, Kelantan ...	88.5	73.7	81.1	92	71	84	76	84.2	85.1	12.35	313.7	2.46	18	15	3	—	1	169.60	5.65	46
Kuala Trengganu, Trengganu	88.8	72.9	80.9	92	71	85	76	83.9	85.3	3.52	89.4	0.96	17	10	2	—	1	176.10	5.87	49
Labuan ...	87.4	76.9	82.1	90	73	85	81	84.9	86.2	13.99	355.3	2.62	15	13	3	—	1	205.75	6.86	57
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft	73.5	61.9	67.7	77	60	68	64	72.3	72.9	5.79	147.1	1.23	21	15	5	12	2	155.85	5.19	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.9	56.5	64.2	76	49	66	61	70.5	70.9	8.57	217.7	2.52	22	19	—	1	6	115.80	3.86	32
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ..	71.5	58.9	65.2	76	57	64	61	*	*	8.42	213.9	2.51	20	16	*	*	6	129.20	4.31	36

* Not recorded.

THE

Malayan Agricultural Journal.

DECEMBER, 1938

EDITORIAL.

Padi Experiments.

Following our usual custom, we devote the major portion of the December number of this Journal to a report on the progress in Malaya of the field investigations on padi. The Compiler of the account of this work during the padi season 1937—38, Mr. R. B. Jagoe, has drawn together the threads for his account from the 5 Padi Experiment Stations and 50 Padi Test Plots, distributed throughout Malaya.

The main problems appear to be concerned firstly, with water control; secondly, to give each area a variety of padi suited to local conditions, and thirdly, with manuring and cultivation.

With regard to water supply, Mr. Jagoe points out that water supply and water control are the first essentials, and until these are secured, padi cultivation is an uncertain and often unprofitable undertaking. The progress and value of the work of the Drainage and Irrigation Department has been commented upon in this Journal from time to time. Valuable results have been achieved by that Department in the opening up of new and extensive areas of land for padi cultivation. Equally successful, though perhaps less spectacular, has been the work of improving the water control of numerous small areas in different parts of the country. On a recent tour the present writer took the opportunity of inspecting a few such enterprises in areas which have been known to him for many years past, and was impressed by the vigour and general health of the crop which was nearing the flowering stage. Small areas form a not inconsiderable proportion of the total area under the crop, and while the task of improving irrigation under such conditions may be arduous, it is most certainly justified by results.

In the same way as irrigation of each small area is considered an individual problem, likewise the task of finding or adapting a variety of padi for each small area constitutes a separate problem. This explains the existence of the many small padi Test Stations throughout the country. The behaviour of a variety of padi varies considerably in different parts of the country. This variation is found in many characters of a variety of padi, but is most easily demonstrated by the difference in growing period. Mr. Jagoe points, for instance, to the fact that a type of padi may take a little over three months from planting to maturity in one part of the country and six months in another area.

The task of giving each area the best variety to suit local conditions has been steadily pursued by the Department of Agriculture for many years, and a considerable measure of success in this direction has been achieved. On such a problem, however, there can be no finality, and we confidently anticipate that the yield per acre by the employment of selected planting material will be still further increased as the investigations proceed.

Cultivation problems are also of a local nature, for methods used in one area are not necessarily applicable to another area. In this direction considerable progress has been made, and the cultivators induced, through practical demonstrations, to adopt methods which are an improvement on the time-honoured and more primitive methods.

Manurial experiments have been continued on the lines described in previous progress reports. The peculiar conditions under which padi grows render these investigations most difficult. Under certain conditions the yield of padi may be increased by manuring, but there still remains an unexplained "bar"— a point at which further applications of manure result in no increased crop. The sudden death of Mr. J. H. Dennett, who devoted much of his time to this problem, has held up the development of this work for the time being, but the field investigations have been continued, although so far, without a solution to the problem.

The importance of increasing the local production of rice has for many years been emphasized by the Department of Agriculture, and has been recently publicly discussed in several quarters. The lines of investigations pursued by the Department for the past 25 years have resulted in the accumulation of much valuable data of use in this connexion, and for those who wish to study the practical aspects of the problem of making Malaya more independent of imported rice we cannot do better than to advise them to give their consideration to reports, articles and special bulletins on this subject which we have published, and to the last annual report of the Drainage and Irrigation Department.

Original Article.

PADI SELECTION AND VARIETAL TRIALS 1937-38

Compiled by
R. B. JAGOE,
Botanist.

The following is a summary of varietal trials and selection work carried out by the Field Branch of the Department of Agriculture in twelve States and Settlements in the Malay Peninsula and in Borneo during the 1937-38 season.

The distribution of Experiment and Test Stations can be seen on the accompaning map, and is as follows:—

Perlis	...	2 Test Stations
Kedah	...	Telok Chengai Experiment Station and 6 Test Stations.
Penang	...	1 Test Station.
Province Wellesley	...	2 Test Stations.
Perak	...	Titi Serong and Talang Experiment Station and 10 Test Stations.
Selangor	...	5 Test Stations.
Negri Sembilan	...	3 Test Stations.
Malacca	...	Pulau Gadong Experiment Station and 2 Test Stations.
Pahang	...	8 Test Stations.
Johore	...	3 Test Stations.
Kelantan	...	Kota Bahru Experiment Station and 3 Test Stations.
Brunei	...	4 Test Stations, one of which is being developed as an Experiment Station for selection work.
Labuan	...	1 Test Station.

(A total of 5 Experiment Stations and 50 Test Stations).

As formerly,* standard Latin Squares were used (except where otherwise stated) and the minimum significant difference between yields of any two strains or varieties has been estimated on a basis of Fisher's "t" test for 95 per cent probability.

The season as a whole was not favourable for the rice crop, due, mainly, in the north of the Peninsula (Kedah, Province Wellesley, Perak (North), Kelantan) to drought between sowing and planting time, which prevented transplanting from taking place until the padi plants had been an exceptionally long time in the nursery beds, and in the south due to a variety of causes but most often to floods later in the season. These factors adversely affected the yields of the varietal trials at many of the Test Stations.

At several of the Test Stations, varietal trials have provided definite information as regards suitable varieties for particular conditions but the most valuable work of the season has been in selection of strains of local varieties and in examination of facts and factors with regard to methods of cultivation and most suitable dates of sowing.

* *Malayan Agricultural Journal,* Vol. XXV No. 12, 1937.

PERLIS.

Kampong Salang Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36.	Season 1936-37.	Season 1937-38.
Siam 29 ...	22.3	31.4	22.5
„ 76 ...	18.0	30.1	22.0
Nachin 10 ...	24.0	30.8	25.5
Radin China 4 ...	—	30.7	—
Mayang Ebus 88 ...	17.2	—	—
Reyong 20 ...	21.2	—	23.9
Radin Pulau ...	18 0	28 6	21.4
† S.D. ...	—	1.2	1.7
M.S.D. ...	—	1.8 lbs.	2.5 lbs.

There is no marked 'significance' amongst the selected strains over a period of three years.

Seriab Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36.	Season 1936-37.	Season 1937-38.
Siam 29 ...	29.0	23.7	27.3
„ 76 ...	23.7	—	27.3
Nachin 10 ...	24.5	21.3	—
Radin China 4 ...	—	19.9	—
Radin China 17 ...	—	—	30.7
Mayang Ebus 80 ...	—	—	30.1
Reyong 20 ...	16.2	—	—
Chubai 18 ...	—	20.8	—
To' Awang ...	24.7	23.5	26.4
S. D. ...	—	0.9	2.0
M. S. D. ...	—	1.3 lbs.	2.9 lbs.

† S.D. = Standard Deviation.
M.S.D. = Minimum Significant Difference.

The soil conditions at Seriab are considered not fully typical of the coastal heavy clays and a new site at Permatang Pauh has been arranged for next season.

KEDAH.

Telok Chengai Experiment Station.

Three varieties were under selection for their first year *viz*:— Mayang Tekai (from North Kedah), Serendah Sungei Dua (a popular Baling variety) and Raja Muda (a variety obtained from Siam). One hundred ear-to-row lines of the two former varieties, and fifty of the last, were planted out. After rejections had been made on vegetative characters and yield, the number of lines retained was 25, 24 and 19 respectively.

Jitra Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36.	Season 1936-37.	Season 1937-38.
Mayang Ebus 80 ...	38.2	29.1	18.8
„ 88 ...	35.0	--	—
Radin China 17 ...	35.1	30.9	18.3
Radin China 4 ...	34.8	—	—
Siam 76 ...	—	28.5	19.0
Reyong 6 ...	—	25.2 rat damage	21.3
S. D. ...	1.0	3.7	0.7
M. S. D. ...	1.8 lbs.	6.5 lbs.	1.2 lbs.

Salak Kanan Test Station.

Variety	Mean Yield per 1/120th acre in lbs		
	Season 1935-36	Season 1936-37	Season 1937-38
Mayang Ebus 80 ..	51.7	21 0	—
„ 88 ..	47.2	25.4	—
Radin China 4 ...	50.5	—	23.8
„ 17 ...	48.9	—	22.1
Siam 76 ...	—	25.7	—
Reyong 6 ...	—	21.8	—
„ 20 ...	—	—	20.7
Siam 29 ...	—	—	30.3
S. D. ...	3.5	2.0	2.3
M. S. D. ...	6.1 lbs.	3.5 lbs.	3.9 lbs.

Rantau Panjang Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36.	Season 1936-37.	Season 1937-38.
Mayang Ebus 80 ...	—	29.6	19.4
„ 88 ...	—	26.0	21.7
Siam 29 ...	32.6	30.0	16.4
„ 76 ...	32.5	—	—
Reyong 20 ...	32.7	—	—
Nachin 10 ...	34.6	30.0	17.2
Radin China 4 ...	35.3	27.4	15.0
S. D. ...	2.0	1.9	2.1
M. S. D. ...	2.8 lbs.	2.8 lbs.	3.1 lbs.

Pulai Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36.	Season 1936-37.	Season 1937-38.
Siam 29 ...	42.5	40.2	—
„ 76 ...	39.1	40.7	—
Reyong 20 ...	36.9	—	—
„ 6 ...	—	—	28.6
Nachin 10 ...	35.2	—	—
Serendah S. Dua ...	40.2	39.8	—
Radin China 17 ...	—	44.8	33.1
„ 4 ...	—	—	32.3
Mayang Ebus 80 ...	—	44.7	35.5
„ 88 ...	—	—	31.0
S.D. ...	2.7	3.8	2.4
M.S.D. ...	4.0 lbs.	5.5 lbs.	3.5 lbs.

Langkawi Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36	Season 1936-37.	Season 1937-38.
Siam 29 ...	12.8	10.9	12.5
Nachin 10 ...	12.6	16.1	15.6
Puteh Melayau ...	9.6	—	—
Radin Siak 7 ...	9 4	—	—
Radin China 4 ...	—	10.5	10.6
Reyong 20 ...	—	7.4	12.5
S. D. ...	0.6	Rat damage	2.4
M. S. D. ...	1.0 lbs.		4.1 lbs.

The soil in Langkwai Island is very sandy and the average yields obtained from local varieties is about 1000 lbs. per acre, so that the above yields may be considered satisfactory. Nachin 10 appears to be better than other varieties which have been tried.

Langgar Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	18.9	Siam 29 ...	19.8
To' Seman 42 ...	16.5	To' Seman 35 ...	17.5
„ 88 ...	16.0	„ 103 ...	16.8
„ 5 ...	15.6	„ 12 ...	16.1
„ 7 ...	15.4	„ 100 ...	15.4
S.D. ...	1.0	—	1.2
M.S.D. ...	1.5 lbs.	—	1.8 lbs.

The season in Kedah was a poor one, and little exact information can be obtained from the results of varietal trials. The difficulties of the past two seasons are partly responsible for this, but they only stress the necessity for greater continuity, which has already been realised, in the design of future varietal trials.

PENANG.
Genting Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Mayang Kuning 48 ...	23.9	Seraup 371 ...	19.4
Mayang SaBatil 8 ...	22.5	Seraup 36 ...	19.2
M.S.B. Local ...	20.6	Mayang SaBatil ...	20.1
Siam 15 ...	21.1	Seraup 146 ...	17.6
„ 48 ...	17.3	Seraup 48 ...	17.8
S.D. ...	1.0	— ...	0.9
M.S.D. ...	1.4 lbs.	— ...	1.3 lbs.

It would appear that the local variety Mayang SaBatil is as suitable as any other variety for this area and it is possible that selections of this variety might be better than anything else.

PROVINCE WELLESLEY.
Bukit Merah Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Mayang Ebus 80 ...	12.6	Mayang Ebus 80 ...	13.4
Reyong 6 ...	12.1	„ 203 ...	12.6
Nachin 66 ...	9.8	Reyong 6 ...	11.4
Patoh ...	10.5	Siam 29 ...	12.6
Anak Didek ...	11.7	Milek Puteh 148 ...	10.5
Nachin 66 ...	11.2	Kunchor ...	12.1
Reyong 6 ...	11.1	Reyong 6 ...	11.4
Nachin 11 ...	10.8	Coimbatore 2 ...	11.5
Patoh ...	10.3	„ 5 ...	11.1
Anak Didek ...	10.2	„ 7 ...	10.7

No analyses were made on account of the uniform poorness of yields.

Sowing took place in July, but, on account of the drought, cultivation was irregular and transplanting was not possible until October, when seedlings had been 80 days in the nurseries; yields at Bukit Merah were therefore very poor and no analyses of the results have been made on this account.

The plot which is cultivated and in which vegetables were grown in the 1936 off season was planted with Mayang Ebus 80 and again gave notably better yields than any other section of the Test Station.

Local padi planters have very definite opinions about the different Mayang Ebus selections. Selections of this variety from Province Wellesley made at Titi Serong (*e.g.* M.E. 203,209) require plenty of water to give their best performance, while those from Kedah made at Telok Chengai (e.g. M.E. 80, 88) are generally more suitable for central Province Wellesley and in situations where the land is high and inclined to be dry.

Sungei Acheh Test Station.

Latin Squares of Seraup strains and Mayang Kuning 48 were laid down but considerable rat damage during October and November very seriously affected what showed promise of being a very fine crop. Of the undamaged portions of the seed multiplication plots there is little doubt that M.K. 48 was the best, as in the previous season.

PERAK.

Titi Serong Experiment Station.

Water supplies were insufficient during the nursery period and planting was delayed until early September. Conditions during the growing period were good, but showery weather at the beginning of February made drainage difficult to effect, and at harvest the padi fields were still under water.

Mayang Kuning 48 has done well, but its maturation period being somewhat longer than that of the Seraups makes it unlikely that it will ever be generally popular.

Selection Work.

There is again nothing to choose between the Machang selections, but this season Seraup 48 has beaten them in the Latin Square trial, so that they do not seem to be of great promise. Nevertheless, they have grain of good type.

As in lines in previous years Mayang SaBatil 8 has given the highest yield. Mayang SaBatil 4, 5, 6 and 9 do not appear, however, to be very much inferior.

Tongkat 2 is again the highest in yield with 7 and 10 not very far behind.

Further selection work is being carried out as follows:—

Machang. Nineteen lines, remaining from material obtained in Kuala Kurau two years ago, were grown and of these it has been recommended for selection that only lines 51, 52, 59, 61, 63, 64, 65, 66 and 74 be retained. These will be compared next season with Machang 2, the best of the first series of Machang selections.

Seraups. Seventy-six lines of Seraups, selected at Briah, Kuala Kurau, Titi Serong and Bagan Serai, were grown. Of these 23 lines with average yields of

Titi Serong Experiment Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 48 ...	18.1	Seraup 48 ...	17.8
„ 146 ...	19.1	Machang 2 ...	17.8
„ 371 ...	19.9	„ 5 ...	17.2
Mayang Kuning 48 ...	19.9	„ 10 ...	17.4
By inspection no significant differences.		By inspection no significant differences.	
Mayang Sa Batil 4 ...	19.3	Mayang SaBatil 7 ...	18.0
„ 5 ...	20.8	„ 8 ...	20.9
„ 6 ...	20.7	„ 9 ...	19.2
Seraup 48 ...	16.6	Seraup 48 ...	15.7
By inspection S. 48 significantly inferior to Mayang SaBatil.		S.D. M.S.D.	1.3 2.3 lbs.
Seraup 48 ...	15.5		
Tongkat 1 ...	17.7		
„ 2 ...	20.0		
„ 7 ...	19.9	S.D. M.S.D.	1.0 1.5 lbs.
„ 10 ...	19.3		

below 70 grammes per plant have been discarded. Lines Nos. 578 and 517 both yielded over an average of 100 grammes per plant, which is very good indeed for a poor season.

Seri Raja. Thirty-six lines, obtained after preliminary selection at Sungei Kapar and Selinsing during the previous season, were grown. Yields were not very high, but 20 lines which gave over an average of 70 grammes per plant have been retained.

Serendah. Thirteen lines from Bagan Serai were grown. The lines were very mixed in type but eight of them will be kept for next season.

Chantek Merah and C. Puteh. Twenty-one lines from Lenggong, *via* Talang, were grown at Titi Serong this season. They suffered from bird damage and all will be grown again next season.

The discarding has been rather drastic in several cases, but with the addition of a number of lines of Mayang SaBatil from Province Wellesley next season, both space and the time of the staff at Titi Serong will be very fully occupied.

Planting Distance Experiments.

It had been found that in the more fertile areas of Krian, Seraup 146 and Seraup 371 gave much better yields than Seraup 48, but that in other circumstances Seraup 48 was the better. It was thought that planting distances might have some influence on these differences in yields.

Experiments were therefore designed and consisted of Latin Square trials with replications of plots with different planting distances for each of the three varieties. These were laid down at Kuala Kurau, Titi Serong, Bagan Serai and Sungei Kepar Stations.

Planting distances employed and the number of hills required per 1/120 acre plot are as follows:—

12" x 12"	15" x 15"	18" x 18"	21" x 21"	24" x 24"
363 hills	233	162	119	91 hills

Yields of grain and counts of tillers per hill have been recorded and analyses of results were made by calculating the yields per hill, yields per tiller and tillers per acre.

No evidence was found to show that there is any difference between the strains in the effect of planting distance on yields, but the experiment is being continued and will be more fully considered at the end of the 1938-39 season.

Kampong Kedah Test Station.

Variety.	Mean Yield per 1/120th acre in lbs	Variety	Mean Yield per 1/120th acre in lbs.
Seraup 48 ...	23 6	Seraup 48 ...	23.6
„ 146 ...	24.9	„ 146 ...	21.6
„ 371 ...	22.1	„ 371 ...	20.5
Mayang Kuning 48 ...	19.6	Radin 13 ...	15.5
		Radin 11 ...	12.7
S.D. ...	3.3	S.D. ...	2.1
M.S.D. ...	5.7 lbs.	M.S.D. ...	3.1 lbs.

Fairly good yields were obtained with Seraup strains, and results confirm the fact that Seraups (long term) are more suitable than Radin (medium term) varieties since the supply of irrigation water has been improved.

The purpose of this Test Station has been accomplished and it will be discontinued.

Kuala Kurau Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36	Season 1936-37	Season 1937-38
Seraup 48 ...	29.9	20.0 ...	17.0
„ 146 ...	37.0	30.8 ...	24.8
„ 371 ...	33.4	31.2 ...	24.6
Mayang Kuning 48 ...	(33.3)	24.7 ...	23.6
S.D. ...	2.1	2.1 ...	1.7
M.S.D. ...	2.6 lbs.	3.7 lbs. ...	3.0 lbs

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 4 ...	27.2	Mayang SaBatil 7 ...	28.9
„ 5 ...	24.7	„ 8 ...	32.1
„ 6 ...	30.0	„ 9 ...	31.2
Seraup 48 ...	16.3	Seraup 48 ...	13.5

Bird damage occurred in several plots, and results are therefore not analysed, but it is obvious that Seraup 48 is significantly inferior to Mayang SaBatil, corroborating the Latin Square trials conducted at Titi Serong.

Results of the last three seasons indicate very clearly that Seraup 48 is significantly inferior in yielding ability to Seraups 146 and 371, as far as these trials are concerned, and additional evidence would seem to point to the fact that, although in the somewhat lighter or poorer soils, as at Kampong Kedah, Seraup 48 is the most satisfactory strain in joint consideration of its yields and straw characters, the substantially heavier yields of Seraups 146 and 371 in the deep and fertile soils along the coast, are likely to counter-balance any inferiority in straw strength, as far as this region is concerned.

Breeding work carried out in Kuala Lumpur by the Botanist during this season included crossings of Seraup 48 and Seraup 371 in an attempt to combine their good qualities.

Tanjong Piandang Test Station.

The Station will be opened next season in the extension of padi land towards the sea, along the coast road, and will combine padi trials and duck farming.

Bagan Serai Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 48 ...	13.6	Seraup 48 ...	15.9
„ 146 ...	15.2	„ 371 ...	17.6
„ 371 ...	15.2	Radin 4 ...	18.6
Mayang Kuning 48 ...	18.5	„ 7 ...	19.0
S.D. ...	1.8	S.D. ...	2.5
M.S.D. ...	3.1 lbs.	M S.D. ...	4 3 lbs.
Seraup 48 ...	16.1	By inspection no significant differences.	
„ 146 ...	17.1		
Radin 11 ...	17.6		
„ 13 ...	17.8		
Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36	Season 1936-37	Season 1937-38
Seraups ...	16.3	12.2	16.2
Radins ...	17.6	14 4	18.2

Three years' results show a distinct bias in favour of Radin varieties, but yields are not very impressive and new local selections and introductions might be tried.

Briah Test Station.

The average yields per 1/120 acre in the 1936-37 season were 17.7 lbs. for Seraups and 18.3 lbs. for Radins, and this season Radin strains have again shown general superiority over Seraups. Yields of Siam 29 are variable and it is unpopular on account of its liability to lodge, which is especially manifest in Briah conditions, with hard soil, inclined to be peaty in varying degree.

Yields have never been very satisfactory except in the 1934-35 season which was a notably good one as regards the weather.

The area is not very good as regards control of water, and Mayang Ebus 80, a Kedah selection, might be worth a trial.

Briah Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 48 ...	14.1	Radin 4 ...	15.1
„ 146 ...	15.1	„ 7 ...	15.7
Radin 11 ...	17.4	„ 11 ...	15.5
„ 13 ...	16.1	„ 13 ...	16.2
Siam 29 ...	13.7	Siam 29 ...	12.3
S.D. ...	1.2	By inspection, Siam 29 significantly inferior to Radin strains.	
M.S.D. ...	1.8 lbs.		
Seraup 48 ...	11.8	By inspection no significant differences.	
„ 146 ...	10.9		
„ 371 ...	11.4		
Mayang Kuning 48...	12.0		

Selinsing Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Radin 4 ...	14.7	Seraup 48 ...	12.0
„ 7 ...	14.7	„ 146 ...	11.9
„ 9 ...	13.0	Radin 11 ...	12.3
„ 13 ...	13.4	„ 13 ...	12.9
Siam 29 ...	6.0	Siam 29 ...	8.0
By inspection, Siam 29 significantly inferior to Radin and Seraup varieties.			
Seraup 48 ...	11.5	S.D. ... 1.1	
„ 146 ...	14.3	M.S.D. ... 1.9 lbs.	
„ 371 ...	12.8		
Mayang Kuning 48 ...	13.7		

Padi crops have never been good on the, usually, rather hard sandy or stiff shale soils of the Selinsing-Semanggol area, nor has there been much difference between the yields obtained from the Seraup and Radin varieties which have been tried. An increase in the range of varieties for trial might be an advantage.

On a few occasions, cultivation trials have shown that substantial increases in yield of grain may be obtained as a result of digging the soil just before the padi season, and it is possible that an extension of the cultivation experiments, in place of the Latin Square varietal trials, might, at present, be a more valuable demonstration.

Sungei Kepar Test Station.

Yields from the varieties in the Latin Square trials are so low that they are of no value. An area of 300 acres near the 15th mile Taiping Road is very liable to suffer from flooding of the Sungai Kurau, where natural drainage in such circumstances may have been interfered with by the construction of the road. The Test Station is situated in the lowest-lying portion of this area and therefore is most susceptible to flood damage.

Apart from this the soil is fairly good, but, as it is not very typical of the predominantly hard soil of the Semanggol district, this is only another reason why a change of site may be advisable.

Bukit Gantang Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	Season 1935-36	Season 1936-37.	Season 1937-38.
Siam 15 ...	15.9	25.5	28.4
„ 48 ...	24.6	25.4	27.1
„ 146 ...	24.5	32.3	32.3
Mayang Kuning 48 ...	—	31.8	32.9
S.D. ...	2.0	—	1.5
M.S.D. ...	3.3	—	2.6
Siam 29 ...	15.5	26.1	15.8
„ 76 ...	23.2	25.4	16.2
Radin 11 ...	21.5	23.1	23.9
„ 13 ...	21.2	23.6	23.0
S.D. ...	2.5	—	Rat damage
M.S.D. ...	4.3	—	—

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Machang 2 ...	30.6	Tongkat 2 ...	24.8
„ 5 ...	29.3	„ 10 ...	25.3
„ 10 ...	30.0	7 ...	26.3
Seraup 48 ...	28.3	Seraup 48 ...	24.9
S.D. ...	1.25	By inspection no significant differences.	
M.S.D. ...	2.2		

A summary of results of Latin Square trials of the past three years indicates the general superiority of Seraup strains over Siam and Radin strains.

Krian selections of Machang and Tongkat (other long term varieties) were tried in Latin Squares this season and show some promise, especially Machang 2.

Bruas Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 146 ...	16.0	Siam 29 ...	17.4
Seraup (local) ...	19.7	Pahit (Bota) ...	12.3
Pahit (Bruas) ...	17.7	Seri Bumi Puteh ...	11.4
Chantek ...	18.5	Radin Deli ...	11.5
Sakepol ...	20.0	Medan Petani ...	7.8
S.D. M.S.D.	1.9 2.8 lbs.	Siam 29 significantly superior to other varieties.	
Seraup 36 ...	20.1	By inspection, no significant differences.	
„ 146 ...	19.5		
„ 371 ...	18.4		
Siam 29 ...	19.9		

Much of the soil at Bruas has shown itself to be inimicable to the good growth of padi, but conditions seem to be improving. Radin varieties were not planted this year as they have been consistently poor.

Some of the local long term varieties tried in Latin Squares, with Seraup 146 as standard, would seem to be worth further consideration.

Talang Experiment Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 48 ...	19.4	Radin 11 ...	20.3
„ 146 ...	21.3	Siam 29 ...	22.9
„ 371 ...	22.4	Seraup 371 ...	21.5
Mayang Kuning 48 ...	18.4	Mayang Kuning 48...	23.1
Not analysed on account of rat damage.		S.D. 2.8 No significant differences.	

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Mayang Ebus 88 ...	26.4	Reyong 20 ...	27.8
„ 202 ...	26.8	Siam 29 ...	29.0
„ 203 ...	25.3	Radin 1 ...	26.2
„ 210 ...	24.3	„ 13 ...	24.2
By inspection, no significant differences.		S.D. 1.7 M.S.D. 3.0 lbs	

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Mayang Ebus 10 ...	32.3	Mayang Ebus 10 ...	27.6
„ 11 ...	29.6	„ 11 ...	28.0
„ 13 ...	29.6	„ 30 ...	27.8
„ 203 ...	28.5	„ 203 ...	26.0
By inspection, no significant differences.		By inspection, no significant differences.	

For five years Mayang Ebus selections have consistently given very satisfactory yields, being much more consistent than any other variety, and the latest Mayang Ebus selections from Krian (Nos. 10, 11, 13 and 30) appeared also to be very good.

Local varieties in earlier stages of selection are Chantek Merah (7 lines), Chantek Puteh (14 lines), and Radin Che Mah (31 lines).

As in previous seasons Radin Che Mah did well, growth and tillering were good and there was absence of lodging. Chantek Merah and Chantek Puteh, on the other hand, showed a tendency to lodge, were later in ripening, and appeared to prefer deeper soil and more water than was available at Talang.

The Siam 29 X Radin 2 hybrid selections H 1/3, 1/9, 1/11, 1/14 were grown in lines, and H 1/9, and H 1/3 were again slightly superior to the other two. It has been arranged to test these hybrids in Latin Square and field trials at several other Stations next season.

Sungei Manik Test Station.

The Test Station was commenced in 1935-36 in the Sungei Manik district in South Perak where an area of 30,000 acres is being developed with 24,000 acres as irrigated padi land.*

About 5,000 acres have been cultivated, but owing to the cover provided by the presence of jungle stumps and felled timber and the proximity of much newly opened land, rats are very numerous and Latin Square trials again suffered so much damage that tabulated yields are not worth recording. The two strains of Radin Merah, R.4 and R.7, with their strong tough straw, escaped with little or no damage and gave yields at 25.4 lbs. and 24.1 lbs. respectively, per 1/120 acre. Seraup 371 and Radin 13 were the next best in yields.

The land is fertile and some excellent crops have been obtained; but the control of water is not yet possible and drought, floods and rats still make it impossible to conduct varietal trials with reasonable reliability.

SELANGOR.

Kajang Test Station.

No varietal trials were laid down pending further examination of factors relating to season and water control.

Kuang Test Station.

No experiments were carried out at Kuang this season with the exception of the planting of several varieties in plots where the unsuitable nature of the soil was most evident during the 1936-37 season.

Small scattered areas of poorly developed padi plants were observed this past season, but the distribution cannot be correlated with that of the previous season, neither can any definite conclusion be drawn regarding varietal susceptibility.

Siam 29 gave crops averaging about 20 lbs. per 1/120 acre, and two local varieties, Banjar Rendah and Che Minah, gave reasonable returns.

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* Annual Report of the Drainage and Irrigation Department, F.M.S. and S.S. 1937.

With the improved water supply and the more satisfactory crop obtained, it is considered that it may be worth while recommencing varietal trials next season.

Tanjong Karang Test Station.

This Station is situated in a strip of land which is suitable for padi cultivation, but lies between the coast and a large area of swamp jungle in Kuala Selangor just north of the Selangor River.

Panchang Bedena Test Station.

This Station has recently been opened in an area for padi cultivation not long cleared of virgin jungle in the north of Kuala Selangor. Yields are very variable and growth uneven due to adverse conditions, including rat damage. The irrigation and drainage scheme for this area has not yet been completed and as, with insufficient rainfall, water shortage persisted throughout the season, results of trials were not submitted.

In the previous season Siam 29, Reyong 20, Seraup 146 and Nachin 756 gave comparatively good yields and of these Siam 29 appeared to withstand best the lack of water during this past season.

Sungei Haji Durani Test Stations.

This Test Station is situated in the same district as Panchang Bedena but in lower-lying land, and conditions are not yet suitable for varietal trials, owing to danger from flooding.

NEGRI SEMBILAN.

Ulu Klawang Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	24.4	Radin 13 ...	18.8
Reyong 6 ...	23.5	Mayang Ebus 209 ...	21.0
Mayang Ebus 203 ...	15.6	" 203 ...	17.3
Serendah Kuning ...	20.2	Serendah Kuning ...	22.7
S.D.	1.5	S.D.	2.0
M.S.D.	2.6 lbs.	M.S.D.	3.5 lbs.

In consideration of the fact that in the 1936-37 season sowing of padi at the Test Station was over a month later than usual and an appreciably better yield of grain was produced, the possibility was discussed of altering the sowing dates still further, to avoid damage to young seedlings by floods in May and the difficulties of harvesting during the wet weather of November-December, and a small trial was made this season.

The date of normal sowing this season was as in 1936-37, and again the results were good, being in fact the best obtained so far. Nevertheless, the still later sown padi (sown 1st June) in spite of being out of season, compared with surrounding

padi, and suffering pest damage, gave yields which so impressed the local headmen that it was subsequently agreed that sowing dates for the 1938-39 season should be decided upon on this basis.

Ampang Tinggi Test Station.

Sowing dates for all strains tested were unusually late (middle of August) and crops were damaged by floods so severely that yields of grain are not worth recording. It seems obvious from the records of the past three seasons that sowing dates should be, normally, about the first week in July, for a February harvest; and this is to be tried next season.

Kendong Test Station.

Another poor season and optimum dates for sowing remain to be determined. Slight adjustments have been made in sowing dates for next season, but it is possible that here, also, optimum dates may be about the first week in July for medium term varieties, which will mean somewhat later sowing than hitherto.

MALACCA.

Pulau Gadong Experiment Station.

This Experiment Station is situated in an area served by the Tanjong Minyak Irrigation Scheme, but a supplementary supply of water is required and this is obtained by pumping from the Sri Malaka River. It is hoped that it will be possible to increase the supply of pumped water for next year.

The main function of the Experimental Station, besides semi-mechanical and manurial experiments, is to serve as a Selection Station for padi-growing districts throughout the Southern portion of the Peninsula, and local varieties of padi, and varieties from Negri Sembilan and Pahang are now under selection there.

The eight remaining selections of local Serendah were tested in Latin Square trials this season with results as follows:—

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Serendah 14 ...	17.0	Serendah 135 ...	16.7
„ 27 ...	18.7	„ 141 ...	18.6
„ 111 ...	14.0	„ 144 ...	19.7
„ 122 ...	17.5	„ 149 ...	19.1
Serendah Unselected	11.8	Serendah Unselected	12.6
S.D. ...	1.4	S.D. ...	1.2
M.S.D. ...	2.0 lbs.	M.S.D. ...	1.8 lbs.

The ten selections of local Siam, remaining out of a collection made for examination of straw strength, all compared well with the original selection, Siam 29, which, though possessing excellent qualities otherwise, is somewhat deficient in this character.

Other varieties which were under selection are as follows:—

1st	year	ear-to-row Milek Merah	Ex Pahang
,,	,,	Anak Terus	,,
,,	,,	Pilah	,,
,,	,,	Jarum Mas	,,
,,	,,	Gangsa Jeboh	,,
,,	,,	Manchar Kasar	,,
,,	,,	Gangsa Melor	,,
2nd	,,	,, Sri Ayer A	,,
,,	,,	Sri Ayer B	,,
,,	,,	Milek Puteh	,,
,,	,,	Terong Papan	,,
3rd	,,	,, Serendah Puteh	Ex Negri Sembilan
,,	,,	Serendah Kuning	,,
,,	,,	Serendah Salleh	Ex Pahang
,,	,,	Antar Bras	,,
,,	,,	Gandar	,,
,,	,,	Sri Menjadi	,,

Of the varieties under selection for the first year, only Milek Merah was of distinct promise, and of the second year varieties, Sri Ayer appeared to be the best. Maturation periods of all lines of Sri Ayer were 223 days, except for Sri Ayer B 4 which was 231 days from sowing to harvest.

Three lines of Terong Papan did fairly well. Yields were not outstanding, but it has an attractive grain and tillers well. Its maturation period in Malacca is approximately 240 days compared to about 200 days in Pahang.

Of the varieties in their third year of selection, five lines of Serendah Puteh, four lines of Serendah Kuning, three lines of Sri Menjadi and one line of Serendah Salleh have given yields up to Pulau Gadong standards and have been retained. Two lines of Antah Bras have been kept, though they are not very good, and all Gandar lines have been discarded.

Jasin and Alor Gajah Test Stations.

These are two new Test Stations in the Southern and Northern Districts, respectively, of Malacca, which this past season were planted up in large plots of several varieties, to obtain information concerning the fertility of the land.

PAHANG.

There are six main Padi Test Stations in Pahang, three inland and three near the coast. At four of these, varietal trials were laid down last season, but without

much success. The more immediate problems are to ascertain the relative maturation periods of different varieties of padi and to determine the most suitable seasons and methods for padi cultivation . Experiments have now been designed to examine these problems.

At present at Dong, Kuala Lipis and Sungei Blat Stations padi is sown about August, and at Kerdau, Pahang Tua and Bawang sowing takes place approximately in April. Yields vary greatly and are more usually fair to poor. Poor yields in some cases, may be due to unsuitable season, but in other cases, to the dependence for water supply on local rainfall and to the lack of water control.

The control of water, where this is feasible, is being dealt with by the Drainage and Irrigation Department.

Kuala Lipis Test Station.

This Test Station has a poor water supply, but has good drainage into the Lipis River, from which, however, it is very liable to suffer damage by flood water.

No analyses of results of varietal trials have been made on account of the very low standard of yields, but Siam 29, Reyong 20, Milek Kuning 3, Milek Puteh 148 and a local variety Ayer Mas appear to be worth more consideration than other varieties tried.

Dong Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Nachin 11 ...	21.0	Milek Puteh 148 ...	17.6
Milek Kuning 3 ...	19.7	„ 9 ...	12.8
Reyong 20 ...	11.3*	Siam 29 ...	16.2
Terong Papan ...	4.6*	Pekan Puteh ...	15.3
		Gangsa Tembiling ...	9.1*
* Damaged by too much water just after planting.			
Mayang Ebus 80 ...	19.0	Radin China 4 ...	21.0
„ 88 ...	19.9	Radin Siak 17 ...	20.0
„ 203 ...	18.3	„ „ 24 ...	20.6
Umut-Umut ...	8.0	Gangsa Ayer ...	17.6
Local variety obviously inferior.		By inspection, no significant differences.	

This Test Station is situated in the Dong River valley, most of which is supplied with irrigation water either by the Dong Irrigation Scheme or by small local streams. The area is broken up into small "petak" or plots with small degrees of terracing for purpose of water control. The Test Station is within the area supplied by the Irrigation Scheme. Drainage is also good and the soil a fairly fertile one, so that conditions here are very satisfactory, and it is believed that yields could be even better than those recorded above.

Kerdau Test Station.

<table>
<tr><th>Variety.</th><th>Mean Yield per 1/120th acre in lbs.</th><th>Variety.</th><th>Mean Yield per 1/120th acre in lbs.</th></tr>
<tr><td>Reyong 20 ...</td><td>24.0</td><td>Radin Siak 34 ...</td><td>10.2</td></tr>
<tr><td>Mayang Ebus 203 ...</td><td>8.5 *</td><td>„ „ 24 ...</td><td>9.8</td></tr>
<tr><td>Milek Puteh 7 ...</td><td>13.2</td><td>Serendah 875 ...</td><td>10.2</td></tr>
<tr><td>Siam 29 ...</td><td>22.7</td><td>Nachin 756 ...</td><td>11.7</td></tr>
<tr><td colspan="2">* Planted out in April and damaged by excessive amount of water.</td><td colspan="2">All planted out in June and most of it damaged then by too much water, also by birds at an early ripening.</td></tr>
<tr><td>Siam 29 ...</td><td>18.3</td><td colspan="2" rowspan="5">Very great variation in plot yields on account of damage by frequent minor floodings.

By inspection, no significant differences.</td></tr>
<tr><td>Nachin 66 ...</td><td>16.1</td></tr>
<tr><td>Milek Kuning 3 ...</td><td>20.5</td></tr>
<tr><td>Seri Ayer ...</td><td>16.3</td></tr>
<tr><td>Radin 13 ...</td><td>15.9</td></tr>
</table>

(All above figures are averages of yields from duplicate Latin Squares)

The levels of the land vary a great deal and frequent minor floodings cause considerable damage in the deeper parts, especially if the padi had not long been planted out from nurseries.

A long drain has now been dug, under the supervision of the Drainage and Irrigation Engineer, from the Test Station to the water gate, which may help to prevent floodings having such serious effect.

Normal sowing took place last season from 15th March to 4th April and, in general, the padi which was most successful was that sown at the end of March and planted out in May. Radin Siak (sown 5th May) and other short term varieties ripened before the rest of the padi and were damaged by birds.

A recent visit to this Test Station (October 1938) reveals the fact that, for season 1937-38, an unprecendented drought during September and early October is likely to be the cause of even poorer yields than the floods of last season. This exampli-

fies very clearly the difficulties appertaining to padi cultivation in the majority of these riverine *paya** lands with their dependence for supply of water on the irregular and uncertain rainfall of Pahang, and the lack of proper control of water.

Sungei Blat (Paya Besar) Test Station.

This Test Station is situated in an area of about 3,000 acres of land which has been swamp jungle, with drainage into the Sungei Blat. Drainage has been improved and irrigation water from the Sungei Pandan can now be supplied to 2,150 acres, of which 1,200 have been cleared. Padi cultivation has been commenced on about 500 acres of this.

Three Latin Squares were laid down, but yields are still poor and variable and are not worth recording.

Sowing took place from 8th August to 10th September and padi ripened and harvesting was carried out during March, during which month 17.88 inches of rainfall were recorded at the Station following an unusually dry season.

Average monthly rainfall figures for this Test Station are as follows:—

		Inches.			Inches.
January	...	12.80	July	...	3.00
February	...	7.80	August	...	3.70
March	...	12.40	September	...	6.00
April	...	6.30	October	...	10.20
May	...	5.60	November	...	9.00
June	...	5.00	December	...	11.50

These figures are probably fairly typical for the coastal districts, apart from the heavier rains which occur during November and December along parts of the coast itself. It is reasonable, then, to imagine that a more suitable season would be one which would allow padi to ripen between May and August, provided that the risk of damage to young seedlings by floods in December or January can be overcome.

The possibilities of wet nurseries and two or three transplantings, as practised in Krian, might be worth trial here.

Bawang Test Plot.

Observation plots only were planted here, pending examination of the problem of most suitable sowing date. Siam 29, Siam 76 and Radin 2 sown at the end of April and harvested early in December, and Milek Kuning 3 sown in deeper land at the end of March and harvested in the middle of January, gave reasonably good returns of between 350 to 400 gantangs per acre.

This Test Station has an assured supply of water and good drainage. The land is also very level and has been found suitable for manurial experiments requiring well controlled conditions, but it is not typical of the riverine *paya-paya*† amongst which it is situated.

* *paya* = marsh (see fuller description in summary.)

† *paya-paya* = plural of *paya*.

Pahang Tua Test Plot.

This Test Station is situated in an area which prior to the extraordinary floods of December 1926 was well cultivated and used for *tenggala** padi. The soil is very good but somewhat high lying and therefore without a natural supply of water for irrigation or inundation. Nevertheless, the land was ploughed, seed was broadcast and good yields were obtained at the end of a normal rainy season.

Cultivation of this area has recommenced. Experiments were conducted last season, but lack of rainfall between March and June interfered with sowing and transplanting so that results are valueless. A pump is being installed by the Drainage and Irrigation Department to lift water from the Sungei Pahang Tua, and when this is working it is possible that an August-April season will be better than the present May-January season, although there is the possible danger of floods in October damaging young seedlings. As the land, however, is comparatively high it should not, normally, be liable to serious damage by floods.

Pulau Tawar Test Station.

This Test Station was first opened in the 1936-37 season in the new inundation area of Padang Kangsar on the Pahang River a few miles below Jerantut, but difficulty has been found in retaining water on the land in this area and the Test Station has not yet had a chance of functioning.

Mengkarak Test Station.

A new Test Station has been established in the Temerloh District and is to be opened for varietal trials next season.

JOHORE.

Tenglu Test Station.

Critical experimentation has been discontinued until the problem of water control, and drainage in particular, has been fully examined by the Drainage and Irrigation Department.

Jementah Test Station.

Five Latin Square varietal trials were planted, but abnormal floods occurred in November, followed by destruction by wild pigs and rats so that yields were very disappointing. Reyong 6 (sown June) and Serendah Kuning (sown May) are the varieties which suffered least damage. Observation plots, which were planted in addition, gave somewhat better yields, the best being obtained from Reyong 6, Reyong 20, Serendah Kuning and Radin China 17 with 350 to 400 gantangs per acre. Harvesting took place at the end of January.

Tangkak Test Station.

It is noteworthy that, without exception, the best yields in the Latin Square trials were obtained by varieties which ripened towards the end of February. This

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* *tenggala* = a plough.
Sungei = river.

does not hold good to quite the same extent in the observation plots, but of 7 varieties giving over 500 gantangs per acre, 5 were harvested between the 17th and 26th of February.

This Test Station is only about 20 miles distant from Jementah and it is of particular interest to note the considerable differences in dates of sowing, which are during July-August at Tangkak, but in May-June at Jementah, and in maturation periods, which are three to six weeks longer at Jementah.

Tangkak Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Reyong 20 ...	20.5	Ser. Kuning ...	19.2
Siam 29 ...	15.5	Radin China 17 ...	22.3
Nachin 66 ...	13.4	" 4 ...	13.3
" 11 ...	8.2	Radin 2 ...	10.1
Siam 76 ...	8.0	Lembut Tembiling ...	6.4
S.D. ...	4.5	S.D. ...	5.8
M.S.D. ...	6.6 lbs.	M.S.D. ...	8.5 lbs.
Siam 29 ...	16.8	Reyong 20 ...	26.6
Serendah Kuning ...	15.2	Radin Siak 34 ...	13.6
Mayang Ebus 203 ...	10.4	" " 24 ...	8.5
Siam 76 ...	9.6	" " 17 ...	8.8
By inspection Siam 29 and Serendah Kuning significantly better than the other two strains.		By inspection Reyong 20 significantly better than Radin Siak.	

Yields have been much better at Tangkak, indicating the possibility that August to February may be the best season, but no real comparison can be made until water control facilities, which are now receiving attention, have been improved at Jementah.

It is noteworthy that the highest average yields have been maintained by Seraup strains, and other selected strains of Seraup types are, therefore, being introduced.

Siam 29 has also given good yields except that last season it gave a poor crop in the Latin Square although a good one in the field.

KELANTAN.

Kota Bahru Experiment Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	1935-36	1936-37	1937-38
Siam 29 ...	22.7	25.5	15.2
Siam 76 ...	17.2	22.7	14.3
Nachin 27 ...	13.7	17.2	16.9
Nachin 66 ...	15.9	24.0	19.5
Radin 2 ...	11.8	14.7	16.8
Radin 13 ...	19.7	16.6	15.9
S.D. ...	3.2	1.5	2.5
M.S.D. ...	4.1	1.9	3.2
Seraup 15 ...	26.5	25.5	21.8
„ 36 ...	27.5	24.3	23 6
„ 48 ...	22.4	23.6	19.8
Radin 2 ...	19.2	19.0	16.3
„ 4 ...	25.3	22.1	20.6
Mayang Ebus 203 ...	22.5	17.5	17.2
S.D. ...	1.9	1.7	2.0
M.S.D. ...	2.5	2.2	2.6
Radin Siak 7 ...	20.5	18.9	21.0
„ „ 17 ...	19.4	17.1	20.3
„ „ 18 ...	19.3	16.0	18.4
„ „ 24 ...	19.6	22.1	20.2
S.D.	(No significant difference)	1.3	2.2 lbs.
M.S.D.		2.2 lbs.	1.2

Variety.	Mean Yield per 1/120th acre in lbs.	
Padang Trengganu 5 ...	15.9	P.T. 22 is the best strain, but P.T. 5, 9 & 11 suffered from considerable rat damage.
„ „ 9 ...	17.0	
„ „ 11 ...	16.8	
„ „ 22 ...	20.9	
Padang Trengganu, unselected. ...	17.1	

It is of interest to note that Radin Siak strains give comparatively high yields for they are, in Kelantan, medium rather than short term padi and approximate to Seraups in their maturation periods under Kelantan conditions.

Radin Siak 7 and 24 appear to be slightly better than Radin Siak 17 and 18.

Selection Work.

The following varieties of wet padi were under selection, by ear-to-row method:—

Variety.		No. of lines.	Selection commenced.	Maturation period in days.
Padang Trengganu	...	6	1934-35	225
Morak Sepilai	...	7	1935-36	225
Mayang Sagumpal	...	16	"	225
Singgora	...	11	"	200
Anak Naga	...	16	"	204
Bintang Berayon	...	23	"	207
Nalong	...	50	1937-38	225
Manek Siam	...	50	"	230

Of these only Padang Trengganu has reached the stage for trial in Latin Squares and P.T. 22 is appearing to be somewhat superior to other selections.

It has been decided to discard the variety Bintang Berayon altogether, as a varietal survey has shown it to be of little importance, nor is it a type worthy of much attention.

No very promising lines have been discovered in Anak Naga, Singgora, Mayang Sagumpal or Morak Sepilai and it is probable that re-selection on a wider basis will be necessary.

Some excellent results were obtained in lines of Nalong and Manek Siam, both important varieties in Kelantan and adaptable to various conditions. It is unfortunate that their grains are somewhat small and not particularly well adapted for milling.

Dry Padi Trials and Selection.

Dry padi cultivation or *padi tugalan** is much more important in Kelantan than elsewhere in Malaya, and extensive areas are planted in this way in the Kota Bahru District and smaller areas in the Pasir Mas and Bachok Districts.

Seven varieties of dry padi have been included in trials at Kota Bahru and at Bachok, and some selection work has been in progress on five of them, but results have been disappointing so far.

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* *tugal* = a pointed stick (for making holes into which a few padi seeds are dropped).

Pasir Puteh Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.		
	1935-36	1936-37	1937-38
Siam 29 ...	19.5	14.2	20.4
Nachin 66 ...	20.2	13.9	18.8
Serendah 824 ...	19.8	12.1	17.4
Nachin 756 ...	13.6	12.0	13.1 Rat damage
S.D. ...	1.25	Rat damage	1.8
M.S.D. ...	2.2 lbs.		3.1 lbs.
Siam 29 ...	17.2	9.8	15.9
Siam 76 ...	18 1	10.0	14.3
Radin 4 ...	18.1	10.6	15.1
Radin 13 ...	18.9	9.8	15.8
S.D. ...	1.1	Rat damage	By inspection, no significant differences.
M.S.D. ...	1.9 lbs.		
Siam 29 ...	16.5	9.4	15.4
Padang Trengganu	19.8	15.8	19.1
Nalong ...	20.5	16.4	18.8
Manek Siam ...	21.2	16.4	19.4
Serendah ...	19.2	14.6	15.1
S.D. ...	1.4	Rat damage	1.9
M.S.D. ...	2.1 lbs.		2.8 lbs.
Siam 29 ...	15.2	6.8	13.5
Anak Naga ...	12.4	9.9	16.9
Anak Ulat ...	18.3	12.5	15.7
Chantek ...	18.6	14.0	15.8
Radin 4 ...	—	—	18.1
S.D. ...	2.8	Rat damage	2.0
M.S.D. ...	4.1 lbs.		2.9 lbs.

The soil at Pasir Puteh is light and sandy and yields are not very high. Siam 29 continues to do fairly well but a summary of yields for the past three seasons indicates that there are several local varieties which are probably capable of doing better than introduced selections.

Bachok Test Station.

The soil at Bachok is very sandy and scarcely suited to either wet or dry padi cultivation, especially as cultivation is entirely dependent on rainfall. Yields during the past two seasons have been too low to be worth recording. Work at this Station is now confined to manurial experiments.

Pasir Mas Test Station.

This Station was opened this season. The soil is a clay-loam, slightly heavier than that of the Kota Bharu Station, but, as at Bachok, water supply depends entirely on local rainfall. Yields were poor, due mainly to a late start, and are not recorded.

BRUNEI AND LABUAN.

Kilanas Test Station.

Yields of padi in varietal trials were very poor, the poorest obtained since the Station was opened in 1933-34 season, but yields from observation plots were the highest yet harvested and indicate that Seraup strains are eminently suitable for the locality. Part of the site of this Test Station has proved to be quite unsuitable for experiment work; this will soon be altered and more reliable varietal trials will then be possible.

Selection work is being carried on in Brunei at Kilanas, and this Station is assuming the importance of an Experiment Station.

Varieties under selection are Jongkok, Radin Pasir, Arat, Limbu, Langsat Puteh and Langsat Kuning. Progress has been as follows:—

Jongkok	...	51	lines	were	reduced	to 43	this	season
Radin Pasir	...	41	,,	,,	,,	,, 31	,,	,,
Arat	...	20	,,	,,	,,	,, 11	,,	,,
Limbu	...	30	,,	,,	,,	,, 23	,,	,,
Langsat Puteh	...	25	,,	,,	,,	,, 12	,,	,,
Langsat Kuning	...	26	,,	,,	,,	,, 17	,,	,,

In addition, preliminary selection was continued on a further 500 plants of Longkok, and on 500 plants of each of the varieties Langsat and Anusan, from which 30 plants of each were retained for ear-to-row lines the next season.

A survey of all varieties of padi in Brunei is being made.

At Lumapas 500 additional single plants of each of the local varieties Arat and Langsat Kuning were grown and selections have been made from these.

Lumapas Test Station.

Variety.	Mean Yield per 1/120th acre in lbs.	Variety.	Mean Yield per 1/120th acre in lbs.
Seraup 36 ...	22.1	Seraup 15 ...	12.7
„ 146 ...	26.0	„ 48 ...	19.6
„ 371 ...	2?9	Mayang Kuning 48	28.3
Jongkok ...	10.0	Jongkok ...	15.0
Analyses are not made on account of the severity of rat damage in some of the plots.			

Variety.	Mean Yield per 1/120th acre in lbs.	
Siam 29 ...	6.6	Damage by pests was very severe in this Latin Square.
Radin 13 ...	13.5	
Milek Kuning 3 ...	12.6	
Jongkok ...	16.2	

Varietal trials confirmed previous indications that Krian long term selections are the heaviest yielders in this district. Mayang Kuning 48 was included in the trials this season and gave yields of 3,400 lbs. per acre, with Seraup 146 next best with 3,100 lbs. per acre. Seraup 15, Milek Kuning 3 and Siam 29 gave very good yields in seed multiplication plots, but, owing to pest damage, yields were not up to the standards of the 1936-37 season, when four Seraup and Jonkok plots gave over 6000 lbs. per acre in this very fertile soil.

Kuala Abang Test Station.

Lack of water control at Kuala Abang militates against high yields at present. Normally there is shortage of water, but the site is liable to deep flooding. The soil is a good deep clay and if water control can be secured, high yields should be obtainable.

The varieties in the Latin Square trials suffered considerable damage this season by floods, stem borers, birds and rats, and results are therefore not tabulated. The varieties that gave best yields in Latin Square and in observation plots are Siam 29, Milek Kuning 3, Milek Puteh 148 and the local varieties Jongkok and Langsat.

Berakas Test Station.

It is hoped to encourage wet padi cultivation in place of dry padi and preliminary trials were conducted, but the unsuitable nature of the soil and the difficulties of the situation make it probable that a better site in a more suitable area will have to be selected for this Station.

Bukit Kallam Test Station. (Labuan).

Selection work with local varieties continues; of the original selections 25 lines of Siam, 16 of Acheh and 8 of Pasir were planted this season for continued observation, and were reduced to 13, 12 and 7 lines, respectively, for next season.

Second series selection was continued with 44 lines of Rangoon, 22 lines of Siam, 16 of Acheh and 20 of Piasau and a third series was commenced with 500 plants of each of Siam, Rangoon and Piasau.

Sowing took place in August and September and seed multiplication plots of Seraup 15, Siam 29 and Milek Puteh 148 were grown.

MATURATION PERIODS OF PADI.

Considerable differences in maturation periods of many varieties of padi have been noted, and the following table gives a very rough indication of the variation that occurs throughout the Peninsula and Brunei.

	Maturation period in days.			
	Kedah-Kelantan	Brunei	Perak	Southern Areas
Seraup types ...	200	200	240	280
Radin Siak ...	190	185	165	180
Radin, Siam and Nachin types ...	180	190	190	220

The degree of efficiency of water control greatly affects the length of maturation periods of padi, and sowing dates may also be of significant account, but it would seem that the degree of latitude, small though the difference may really be, may have a greater influence than either.

Factors affecting correlated trials are being examined and a series of observation plots are to be laid down in the 1939-40 season in an endeavour to obtain more precise information on the effect of latitude on maturation periods, and possibly yields.

SUMMARY.

Kedah.

The season has been a particularly poor one. The drought which commenced just before planting time was most severely felt in Kedah, and there was, again, some damage from disease. though not to the same extent as last season.

Varietal trials have not provided very much new information and it was decided that more continuity in the Latin Square comparisons is desirable.

Penang and Province Wellesley.

The local variety, Mayang SaBatil, appears to be very suitable for Penang. Selection is being undertaken at Titi Serong Experiment Station in Krian and selected strains, when available, should do well.

In Province Wellesley North the selected strain, Mayang Ebus 80, from Kedah, is gaining in popularity.

In Province Wellesley South, the padi growing area is a natural part of old Krian and conditions are very similar to those of the adjoining north-west portion of that District. The Krian Irrigation Scheme was extended to include this area a year or two ago, but the water supply is, as yet, not sufficient for the whole of it.

Perak, Krian District.

The north-west coastal districts have a deep and fertile soil and are eminently suitable for Seraup and other long term varieties of padi. Seraup 371 and 140 have proved themselves the highest yielding Seraup strains, but Mayang SaBatil selections, now being tried, are also doing very well.

The south-east districts of Krian, with firmer, poorer soil, are very different, and medium term Radin varieties have usually done slightly better than Seraups, but yields have never been very high.

Seraup 48 has maintained a degree of popularity, especially in the intermediate central areas, on account of straw strength and good milling grain.

Perak (general).

The padi growing areas at Bukit Gantang and Bruas are both on granite soil and at both of the Test Stations, Seraup types have done best, although in the older established land, at Bukit Gantang, yields have been higher.

Talang Experiment Station and the majority of the padi lands around Kuala Kangsar are on high-built alluvium over-lying quartzite. The most consistent high yields at Talang have been obtained with Mayang Ebus selections, although good yields were also obtained with Seraups in the 1936-37 season, and with Siam 29, Reyong 20 and Radins on other occasions.

At Sungei Manik, in low-lying alluvium and with good supply of water, good yields should be obtained with Seraup types when the padi land is adequately developed.

Selangor.

Water control is the chief problem, and precise experiments must await the completion of the drainage and irrigation schemes now being carried out by the Drainage and Irrigation Department.

Pahang.

There are two distinct conditions under which padi cultivation is carried on in Pahang. These are the terraced river valley areas as at Dong and Budu, and the stretches of flat land as at Sungei Blat and Pahang Tua, all of which are or can be

irrigated and are easily drained. Then there are the *paya-paya** or swamps which have no assured water supply and, in very many cases, have little or no natural drainage.

Although individually these swamps are small, in the aggregate they form a very considerable proportion of the padi land of Pahang. The majority of them are situated along the banks of the Pahang River from Jerantut to its mouth at Pekan. These riverine swamps are saucer-shaped or dish-shaped in general principle, and varying areas of each are successfully cultivated according to the amount of water present and the varying depths of it throughout the season.

These riverine *paya-paya* have been formed in two ways, either by the daming up of the outlets of small irregular seasonal tributaries, by sand and silt at their mouths, or by the formation of dead water bends as the meandering river gradually changes its course. In most cases, drainage difficulties could be overcome, but these small swamps have very insufficient or no catchment area of hills behind them to provide a regular supply of water, and are too small individually for any expensive scheme for supply of water, as by pumping.

In addition to this, rainfall in Pahang is both more irregular in season and less evenly distributed than is usual on the western side of the Peninsula, and when rain does come it often is very heavy and causes damage by flooding.

Problems of water control are being examined by the Drainage and Irrigation Department.

In the areas with irrigation water, co-ordinated experiments, to determine the most suitable seasons and sowing dates, have been designed for next season.

The question of type of nursery is also receiving attention, but it seems likely that the present normal dry nursery is best suited to most padi areas in Pahang, except possibly at Sungei Blat. where conditions approximate more closely to those of Krian, where wet nurseries are most effective.

Negri Sembilan.

Progress was made in endeavours to ascertain the most suitable dates for sowing.

Malacca.

The position remains unchanged as regards Siam 29 being the most commonly grown strain of padi, but demands for seed of Milek Puteh 9 make it likely that this strain will supercede Nachin 11 for second place in popularity. At Pulau Gadong Experiment Station selection work on varieties of padi from Negri Sembilan and Pahang was continued. The season has been a good one.

Kelantan.

Seraup strains continue to give the highest yields at Kota Bahru, and selection work on promising local varieties is progressing.

Weather conditions were not favourable but this was partially countered by the scheduling of dates for the successive planting operations in each District, which resulted in more regularity in growth and maturation of the crops.

* *paya-paya* = plural of *paya.*

Johore.

The best yields were obtained at Tangkak Test Station, where sowing took place during July and August, and where water supply was satisfactory. Reyong 20 was the best strain in the Latin Square trials and Reyong 6 in the observation plots. Lack of adequate water control (drainage in particular) in several parts of Johore is causing a reduction in the area under cultivation.

Brunei.

Padi cultivation in Brunei is at present dependent on local rainfall, but the soil appears to be very fertile and high yields are expected from Seraup strains when conditions of padi cultivation become better established.

Received for publication 3rd November, 1938.

Abstract.

RICE: FOOD CROP OF TROPICAL AND SUB-TROPICAL LANDS*

Rice (*Oryza sativa*) is the dominant food crop of the plains in the monsoon areas of the tropical and sub-tropical parts of South-eastern Asia, even as wheat is of the temperate lands. Countries enjoying the Mediterranean type of climate, like Italy and Spain, also grow rice. The crop is raised in California, in the United States, in Brazil, in Egypt, and in a number of tropical African territories. In British India, China, Indo-China, Burma, Java-Madura, Japan, Siam, the Philippine Islands, and Korea large areas are under the paddy crop. According to the International Year Book of Agricultural Statistics the area under rice crop throughout the world (excluding China) was 59,100,000 hectares (one hectare= 2.47 acres) in the 1937-38 season. It is instructive to compare this figure with the area under wheat, which amounted to 106,750,000 hectares (excluding Russia) in 1937.

Cultivation.

Rice cultivation demands a high temperature and abundant moisture. The crop has to be grown in fields capable of being flooded at certain stages of its growth; hence areas under rice are distributed along the great river deltas, low-lying sea-board tracts subject to inundation during the summer rains, or in regions commanded by irrigation works. Rice culture entails enormous labour, for the most part in swampy and unhealthy conditions. The seeds are first sown in a carefully tilled and heavily manured seed-bed or nursery. Fields on which rice is to be grown are embanked to retain water as long as may be needed, and the ground is often laboriously levelled for this purpose. Their surface is puddled into a thin mud and green manured.

In four or five weeks after the sowing the seedlings attain a height of eight to ten inches and present a pleasing picture of emerald green under the clear azure blue tropical skies. By then they are ready for removal into the field. The transplantation is effected by hand, often by women, each separate seedling being forced into the soft mud. Were this not done the weeds are apt to get the upper hand and smother the rice crop. When the seedlings are in an early stage of growth two inches of water are ample, but when the stem is strong even high floods are unable to drown the plant.

Under favourable conditions, with forcing sunshine and abundant water supply, the plant grows astonishingly rapidly; the stalk putting on nine inches in height within twenty-four hours is not uncommon.

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* Abstract of an article under the same title, published in *The Manchester Guardian Commercial* of October 21, 1938. *The Manchester Guardian Commercial* has also published the following special article on crops on the dates named :— Maize Sept. 30, Jute July 22, Hemp July 8, Flax June 17, Cotton May 27, Copra May 20, Coffee May 6, Cocoa April 29.

Rice culture calls for heavy manual labour and the aid of cattle for ploughing, treading, and later the transport of paddy from the growing centres to market towns.

A larger share of work falls on the Chinese peasant than on the Indian cultivator, as China is short of cattle. The same factor explains the annual seasonal migration of hundreds of thousands of Indian agricultural labourers to the sparsely populated Burma for sowing and reaping the rice crop of that country.

Here is a fundamental distinction between rice and wheat culture. If wheat, at any rate that part of it which enters international trade, is par excellence the crop of the sparsely populated, relatively prosperous, temperate regions of the globe, and the industry is highly mechanised, rice is the grain crop of the densely peopled tropical and sub-tropical regions, raised almost wholly by manual labour. Moreover, rice is the only food-crop capable of growing in swampy tracts, where no other equally useful cereal would thrive.

The so-called hill rice is sown broadcast on ordinary arable land and is not irrigated. It is often grown in tropical countries in regions as high as 8,000 feet above sea-level, and, little plain land being available under such conditions, terrace cultivation is often resorted to. The yield per acre of hill rice is much less than the crop grown under irrigation.

Curiously enough the best yields of rice come from warm temperate lands, Spain registering 62.8 quintals per hectare, Italy 51.2, and Japan 38.6. The corresponding figures for China, British India, Burma, and Siam amount respectively to 26.5, 13.9, 13.3, and 16.1 quintals per hectare. It is very probable that such striking variations in crop yields are the outcome of the climatic conditions rather than due to the different strains growing in different areas.

Research work in the laboratories and field stations is being done in every leading rice-growing country to evolve disease-resisting and better-yielding strains, on the use of better implements and the application of fertilisers where soil conditions demand it.

One-half of the world acreage under the rice crop is found in India and China. India has the largest acreage under rice, and China is the largest producer of the crop in the world, as the figures of area and yield bring out in the table below.

Preparation and Marketing.

The preparation and marketing of rice is best illustrated by taking the case of Burma, the largest exporter of rice in the world. The paddy market for the new crops opens about the middle of December, and the marketable surplus is largely disposed of by the actual growers within the next four months or so. Landowners who always collect rents and frequently debts from their tenants in kind, traders and speculators, store considerable quantities of paddy till later on in the year in the hope of a rise in prices. Paddy is sold by the hundred baskets; the standard Government basket has a capacity of nine gallons and holds 46lb. It is generally carted loose for storage, supply to the local mills, and transhipment by boat. Bagging is done at the collecting points on the railway line.

The milling of paddy to produce white rice is done by large mills and consists of three main operations, cleaning, husking, and pearling. Extraneous matter and unfilled and small grains are first removed by cleaning. Shelling consists in removing the husk from the kernel, and the products coming out of the huller include shelled rice, containing a small proportion of unhusked rice, broken grain, and some bran and dust. The unhusked rice is separated from the husked rice by a shaker and sent back to the huller. Pearling cone, to rub off the pericarp or outer covering to yield white rice, constitutes the third process, yielding white rice, bran, and rice meal.

Western markets demand a more brightly polished and attractive rice than is produced from the pearling cones. The white rice is further polished, glazed with talc and glucose, and slightly oiled to give it a pleasing translucent appearance. Countries like South India, Ceylon, and certain African territories importing rice in bulk favour the parboiled variety. Here the paddy is steamed (before the skin is removed) and dried in the sun. Parboiling fixes the vitamin of the cuticle in the rice berry, and parboiled rice is thus more nutritious than polished rice.

Formerly England had a fairly important rice-milling industry, but Continental and Asiatic millers have captured the rice-milling trade by reason of their lower operating costs.

All parts of the rice plant are useful. Even the husk forms valuable, though bulky, fuel for the mills. Brown rice is materially richer in fat and protein, besides having a larger content of vitamin B (Oryzanin) than the polished variety. The market however, demands polished rice for its appearance, even as it demands white flour. A diet limited to polished rice renders Eastern races liable to the well-known deficiency disease, beri-beri, which is avoided by mixing some pulse with it.

Rice bran makes excellent cattle food and is much in request for the manufacture of special feeding cakes. Broken rice is used for brewing and distilling. 'Saki,'' the national beverage of Japan, is prepared from rice. It is also used for the preparation of starch and rice flour. Coarse mats, sandals, thatches and packing materials are made out of rice straw and its use as a fodder for cattle is not to be despised.

Rice ranks, after wheat and maize, as the third most important food grain in international commerce. Trade in rice totalled 6,400,000 tons in 1914, including a substantial volume of re-export trade. In recent years it has been well over 7,500,000 tons, including small amounts of paddy not converted to terms of clean rice. If the Western European countries are the leading importers of wheat, Asiatic countries growing rice insufficient to feed their local populations are the chief importers of rice.

The Leading Exporters.

Burma, Indo-China, Siam, Korea, and Formosa are the leading exporters of rice. Burma's average annual rice exports amount to some 3,000,000 tons, half of which are taken by India. Prior to April, 1937, when Burma formed part of India,

	Area in 1,000 hectares.			Production in 1,000 quintals.			Yield in quintals per hectare.*		
	1927-8 to 1931-2.	1936-7	1937-8.	1927-8 to 1931-2.	1936-7	1937-8.	1927-8 to 1931-2.	1936-7	1937-8.
British India ...	28,014	29,347	29,134	404,600	425,397	404,954	14.4	14.5	13.9
China† ...	17,130‡	18,149	—	430,792‡	480,149	—	25.1‡	26.5	—
Indo-China ...	5,441	5,463	—	59,482	63,162	—	—	11.2	—
Burma ...	5,136	5,113	5,205	73,567	71,956	69,374	14.3	14.1	13.3
Java-Madura ...	3,542	3,864	—	53,213	57,719	—	15.0	14.9	—
Japan ...	3,186	3,180	3,190	112,863	124,981	123,087	35.4	39.3	38.6
Siam ...	2,575	2,226	2,912	42,432	33,799	46,956	16.5	15.2	16.1
Philippines ...	1,790	—	—	21,845	22,453	19,800	12.2	—	—
Korea ...	1,604	1,588	1,625	29,534	35,948	48,887	18.4	22.6	30.1
Formosa ...	597	682	658	12,809	17,740	17,136	21.4	26.0	26.0
Ceylon ...	331	340	—	2,767	—	—	8.3	—	—
British Malaya ...	278	299	—	3,478	5,014	—	12.5	16.7	—
Manchukuo ...	208	288	314	3,049	5,744	6,485	14.7	19.9	20.6
Italy ...	141	145	145	6,627	7,340	7,402	47.0	50.7	51.2
Spain ...	48	—	—	2,969	—	—	61 8	—	—
Egypt ...	118	198	111	3,622	6,928	3,711	30.5	35.0	33.6
Madagascar ...	545	486	482	6,777	6,800	6,400	12.4	14.0	13.4
United States ...	387	392	442	8,856	10,002	10,819	22 9	25.5	24.5
British Guiana ...	26	25	—	682	616	—	25.9	24.2	—
Brazil ...	788§	893	—	10,346	12,502	—	14.5§	14.0	—
World total ...	56,190	58,700	59,100	875,700	935,700	929,000	15.6	15.9	15.7

* Unit yields do not in all cases refer to a single crop.
† China's figures not included in totals.
‡ Year 1931-2.
§ Average for two years.
Source: "International Year-Book of Agricultural Statistics."

this trade represented the internal trade of India, but since then it has figured among the exports of Burma and the imports of India.

Rice accounts for 40 per cent. of the total value of Burma's exports, but this figure, though it normally exceeds the value of any other item of the country's export trade, does not adequately reflect the supreme importance of the rice trade in the economic life of Burma. The great bulk of the population of the country is either directly employed in the cultivation, milling, transport, and shipping of rice, or engaged in occupations which derive their prosperity from the rice industry. On the export price of rice depends the welfare of the majority of the population and the state of the rice trade furnishes a fairly reliable barometer of the general prosperity of the country.

The Burman's ability to purchase textile goods from Lancashire hinges on the price he gets for his paddy.

The rice trade is no less important to Siam and Indo-China. With them the relative value of rice exports amounts respectively to over 52 per cent. and 43 per cent. Korea and Formosa, the other chief rice exporters send their exportable surplus to Japan.

Leading purchasers of rice include Japan, British India, and China, and three countries that depend for their prosperity on the plantation industry—namely, Ceylon, British Malaya, and the Netherlands East Indies. All these importers are also growers of rice, and when they have a bumper crop they reduce their import requirements sharply. If, due to drought, floods, or insect pests, their production is below normal, they import larger tonnages from abroad.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE.

9th November, 1938.

In addition to routine business, the Agricultural Advisory Committee, at a meeting held at Kuala Lumpur on 9th November 1938, discussed a number of subjects of considerable importance. The following notes, drawn from the Minutes of the Meeting, deal only with the more important subjects.

Grading of Small Holders' Rubber.

In the absence of Mr. Page, Director, Rubber Research Institute of Malaya, Mr. R. Boyd, Director, Co-operative Department, at the request of the Chairman, reported on the present position.

He stated that experiments in grading rubber in the field have not met with any great success. The village dealers are not prepared to accept this grading since they not sell rubber on a basis of grades. Efforts have been made to induce groups of producers to combine in selling direct to large dealers. One group consignment of rubber has been sold according to grades. The net price obtained, after deducting cost of transport, was $1.94 per picul higher than the quotations in the village at the time of sale. It is hoped to popularize this method of sale.

Proposals for Supply of Rubber Budwood to Small-Holders.

The Chief Field Officer stated that as long ago as 1930 budded rubber was cultivated on Agricultural Stations throughout the country for the purpose of demonstration and instruction in budding. The matter is now receiving the close attention of the Rubber Research Institute and this Department and it has been decided to obtain supplies of budwood of approved cloves from the Rubber Research Institute and lay down multiplication nurseries at Agricultural Stations for the purpose of distributing budwood to small holders by the year 1940. Permission has been obtained from the Controller of Rubber to plant up 25 acres of nurseries and Agricultural Officers have applied for proportional quotas for each State and Settlement. No budded stumps have yet been distributed but nurseries are in the course of preparation in all States and Settlements.

The charges to small-holders for budwood will be such as just to meet cost of production.

The Committee agreed on the desirability of popularizing budded rubber amongst small-holders and approved the steps taken in this matter.

Experiments on Tea Manufacture at Serdang.

The Chairman reported that experiments in the manufacture of China tea are in progress at the Central Experiment Station, Serdang. The results already obtained are encouraging from the point of view of manufacture, but not on the financial side. Shopkeepers are keen to purchase this tea at 30 cents per kati for

retail at 45 cents, but the present cost of production hardly makes the price of 80 cents profitable. The Chairman added that there is no hope of ever producing high grade green teas in Malaya to meet the limited demand from well-to-do Chinese.

The meeting agreed that it is very important to continue these experiments in order to increase the proportion of locally produced tea consumed in Malaya.

High Grade Planting Material for Propagation of Derris.

The Chairman reported that two years ago derris clonal work was commenced at Serdang with the types known as Changi Nos. 1, 2 and 3. Changi No. 3 has been found to be the best grower and to have the highest toxic content. A total of 26 acres of mixed clones of Changi No. 3 is now being planted at Serdang.

Major Georgi of this Department visited the Department of Agriculture and various commercial firms in the United States of America in April last, and discussed the question of derris marketing.

The market for derris has dropped recently on account of the large quantities of cubé (lonchocarpus) which reaches the American market. Cubé root has been grown here experimentally, but proved very unsatisfactory. The Department of Agriculture, Washington, has promised to supply high grade planting material of cubé in exchange for planting material of derris.

A Committee, with Dr. Tempany as Chairman, has been formed in London to deal with vegetable insecticides. It is hoped that it will be possible to arrange for investigations by this Committee of alleged adulteration of derris with cubé in the United Kingdom.

Plant Importation Rules — Importation by Air.

The Chairman reported that in accordance with an amendment to the Plant Importation Rules, 1936, published as Gazette Notification No. 2877 in the Straits Settlements Gazette of 7th October, 1938, permits may be granted to import the following fresh fruit: nectarines, peaches, pears, strawberries, plums, raspberries, red and black currants and gooseberries, by air from Australia into Singapore, provided that the consignment is accompanied in each case by a certificate of freedom from pests and disease signed by a duly authorised member of the Department of Agriculture of the country of origin. Such material will be examined by the Agricultural Officer, Singapore, and the Department has power to withdraw such permits at any time.

Departmental.

FROM THE DISTRICTS.

November, 1938.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

The Weather.

In Kedah and Perlis heavy falls of rain occurred in November resulting in local flooding in the former State and more extensive inundations in the latter. Nevertheless, the total rainfall in Kedah was below average.

In the West Coast areas rain fell plentifully at the end of October but thereafter conditions became warmer and drier, and the average for the month under review is low. Lack of rain has caused damage to crops in some parts of the country. In South Perak storms caused minor localized floods, but failed to bring the rainfall for the month up to normal. In Johore and Singapore also the rainfall was below average.

Pahang has at last been experiencing some good falls of rain. Rivers have been in spate but no serious flooding occurred. Latterly conditions have been drier.

In the coastal areas of Kelantan rainfall has been heavy and much above average. In Kota Bharu a total rainfall of 34.62 inches was recorded for November, and at Bachok 52.76 inches. In the latter district 43.62 inches of rain fell between the 16th and 21st of that month and much flooding resulted. In the inland districts conditions approximated to normal.

Crop Reports.

Rubber.—Prices of good quality smoked sheet varied between $33 and $37 per picul but declined towards the end of the month. The high price obtained for coupons, the effect of the fasting month in the case of Malay owners, and padi cultivation in some districts resulted in a decline in small-holding production.

An increased interest in planting up new land is now being taken and small holders are reported to be buying planting rights. In Pahang applicants for land are stated to be anxious to plant budded rubber. In all States budwood propagating nurseries have been established and every effort will be made to encourage owners to bud rubber on the areas to be planted.

Malay small-holders at Beranang and Ulu Langat in Selangor have decided to form co-operative groups for the preparation and marketing of their rubber. A previously formed group at Bandar recently sold their third consignment in Klang, at an average price of $37.03 per picul, which compares with the local dealers' price of $35.50.

Padi.—The west coast padi areas continue to look very promising. In Pahang and Kelantan, however, weather conditions throughout the season have not been so favourable. In Negri Sembilan the recent spell of dry weather is said to have caused serious damage to fields which are entirely dependent on rainfall; in many parts of this State planting was carried out late owing to unfavourable conditions. In southern Selangor most of the padi is now ripe, and much has been harvested.

This season's crop has so far been reasonably free from serious attacks of disease. Rat damage also has been slight to date.

Arecanuts.—In Johore, where arecanuts constitute an important minor crop, harvesting is now in full swing. When weather conditions have not been suitable for sun-drying, copra kilns have lately been successfully utilized for curing.

Cloves.—It appears that there will be a poor clove crop in Penang this season. Picking is now under way. Rates of 4 to 5 cents per kati are paid for this work. The price of dried cloves remains steady at $45 per picul.

Livestock.

Pigs.—The market price of pigs has at last improved from the uneconomic level at which it has been for many months. Prices in Selangor have risen from $12 to $18 per picul. Unfortunately, many of the Chinese rearers, having for so long received no profit from their pigs, have already disposed of their breeding stock.

Poultry.—There have been reports of epidemics among poultry from several parts of the country. These outbreaks often occur when the weather is cold and wet. Such weather also causes heavy mortality among chickens due to chills and colds.

Alienation of Land in Kedah for Rubber Planting.
A Correction.

In these District notes last month, a statement was made to the effect that the Kedah Government had decided that no new alienation of land should be made for the planting of rubber. The Kedah Government points out that this statement is incorrect. The Government made an announcement in the Penang newspapers on August 15th 1938 that land would be alienated of rubber, and this has not been withdrawn.

DEPARTMENTAL NOTES

Tamil Allotments on Estates.

The article published in this Journal last month, on The Settlement of Tamil Labourers on the Land, has attracted considerable attention and has been the subject of favourable comment in the local press.

Managers of estates and others who desire to encourage market gardening amongst their employees are reminded that officers of this Department are in a position to advise and assist in the development of such schemes. The Department has also published a circular entitled "The Cultivation of Allotments by Tamil Labourers" which is available from this office, price 10 cents per copy post free. A Tamil translation of the circular has been published, copies of which will be sent free of charge on application.

With the object of offering further encouragement to Tamil cultivators, *The Tamil Agricultural Journal*, the official organ in Tamil of the Department of Agriculture, will in future consist of short articles of interest to cultivators, written in simple language, so that it may be of use to those of limited education. Articles of a more technical nature, suitable for educated Tamils, will in future be published as Tamil Circulars.

The decision to effect this change in the Tamil publication has been taken as a result of representations made to the Department, and of a close examination of the problem of how this journal may best serve the nationality for whom it is written.

Advisory Committee, Sultan Idris Training College.

The Principal, School of Agriculture, Malaya, has been appointed an *ex officio* member of the Advisory Committee for the Sultan Idris Training College for Teachers, Tanjong Malim.

Appointment.

Mr. D. G. Jones, B.A., Dip. Agr. Sci. (Camb.) has been appointed to be an Agricultural Officer, Malayan Agricultural Service, with effect from the 7th October, 1938.

Mr. Jones arrived on 3rd November, 1938, and has been temporarily attached to the School of Agriculture, Malaya, as acting Vice-Principal.

Leave.

Major C. D. V. Georgi, O.B.E., returned from leave on 1st December, 1938.

FERTILIZER PRICES, NOVEMBER, 1938.

The following are the prices at the end of November, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

PLANTATION CROPS.

The Imperial Economic Committee has added a volume under the above title to its very useful series of publications on commodities. This review presents in a convenient form, summaries of production and international trade of sugar, tea, coffee, cocoa, spices, tobacco and rubber, with special reference to the part played by the countries of the British Commonwealth and Nations. The publication may be obtained post free for 2s. 9d., from H.M. Stationery Office, Kingsway, London, W.C. 2.

Statistical.

MARKET PRICES.

November, 1938.

Major Crops.

Rubber.—The Singapore price for No. 1. X. Rubber Smoked Sheet varied between $26\frac{1}{2}$ and $29\frac{1}{8}$ cents per lb., the average price for November being 27.96 cents per lb., as compared with 28.70 cents in October. The highest and lowest London quotations were $8\frac{3}{8}$d. and $7\frac{7}{8}$d. per lb., and New York 17 1/16 cents (gold) and 15 7/16 cents. Average prices per lb. in London and New York respectively were 8.15d. and 16.28 cents, as compared with 8.36d. and 16.83 cents gold respectively in October.

Prices paid for small-holders' rubber at three centres during November are shown in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, November, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan		Kuala Kangsar, Perak			Batu Pahat, Johore.				
	3	10	16	23	30	2	9	16	23	30
Smoked Sheet ...	—	36.40	34.00	32.00	33.95	—	—	—	—	32.53
Unsmoked Sheet ...	34.00	—	—	—	—	31.94	32.30	32.50	32.24	
Scrap ...	No purchases									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases of rubber at Kuala Kangsar on 2nd and 9th, and at Kuala Pilah on 17th and 24th November.

Palm Oil.—November prices of Malayan palm oil and kernels showed a slight upward tendency. The average of weekly quotations per ton in October were:—palm oil £13, kernels £8.4.1. Prices in November are shewn in Table II.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
November 11	£ 13. 0. 0 Liverpool	£ 8. 0. 0 Continent
„ 18	13. 5. 0 Canada	8. 0. 0 Rotterdam
„ 25	13. 7. 6 „	8. 10. 0 „
Average	£ 13. 4. 2	£ 8. 3 4

Copra.—As anticipated in the last report, prices of copra dropped still lower than those ruling in October. The average price for the sun-dried grade was $3.06 per picul in November as compared with $3.12 in October. The Mixed grade averaged $2.73 per picul, as compared with $2.78 in October. Prices at the end of November showed an appreciable upward tendency.

Copra cake was quoted throughout the month at $2.05 per picul.

Rice.—The average Singapore wholesale prices of rice per picul in October were as follows:—Siam No. 2 ordinary $4.47, Rangoon No. 1 $3.70, Saigon $4.07, as compared with $4.39, $4.00 and $3.97 respectively in October 1937, and $4.46 $3.85, and $4.10 respectively in September 1938.

The average retail prices in cents per gantang were in Singapore 29, Penang 34, Malacca 30.

The average declared value per picul of imports during October was $4.06 as compared with $3.98 in September and $4.09 in October 1937.

Padi.—In most producing districts, prices tended to be higher than in October: in Kedah, however, the price per 100 gantangs was $7 to $8.20 (as compared with $8.25 to $9 in October), Penang $9, Perak north $11 to $12, Malacca $10 to $11, Kelantan $9.70, Selangor $8.50 to $10.50, Negri Sembilan $7 to $10, Pahang $10 to $14, Brunei $10 to $12, Labuan $12 to $16.

The Government Rice Mill in Krian paid $2.30 per picul, millers in Kedah $1.85 to $2.20, and the Government Rice Mill, Temerloh, Pahang, $2 to $2.10 per picul.

Pineapples.—The market for canned pineapple is stated to be featureless. Singapore prices per case were as follows:—G.A.Q., Spiral $2.95, Round Cut $3.80, Cube $3.00; Golden, $3.20, $4.00 and $3.25 respectively.

The Singapore price of fresh fruit was higher at $1.80 to $1.90 per 100 fruits. In South Johore the prices were, per 100 fruits, 1st quality $1.10 to $1.00, 2nd quality 90 to 70 cents, 3rd quality 75 to 40 cents. In Selangor the price was 70 to 60 cents per 100 large fruits delivered at factory in Klang.

Beverages.

Tea.—Three consignments of lowland tea comprising 219 packages were sold on the London market during November at an average price of 1s. 0d. per lb., and two consignments (186 packages) of upland tea which sold at an average price of 1s. 1. 88d., per lb.

According to *The Tea Brokers' Association of London Reports* for November the average London price per lb. realized during the month for tea from other countries was as follows:—Ceylon 1s. 2. 47d., Java 1s. 0. 88d., Indian Northern 1s. 1. 46d., Indian Southern 1s. 1. 14d., Sumatra 11. 14d.

Coffee.—Coffee prices showed an upward tendency in October. In Singapore, Sourabaya averaged $11.12 to $10.25, and Palembang $12.19 to $11.62—these are averages of highest and lowest quotations.

Liberian coffee was quoted throughout the month at $14.50 per picul and Robusta at $6.50 per picul. Excelsa rose from $9.50 to $10.50 per picul, the average quotation being $9.70 per picul.

Spices.

Arecanuts.—The average of highest and lowest market prices per picul in Singapore during November were as follows:—Splits $6.65 to $4.87, Red Whole $6.69 to $5.12, Sliced $10.75 to $7.50, as compared with $8.39 to $5.00, $6.63 to $4.50, and $11.52 to $8.37 in October. The price within these ranges depends on quality.

The average of Singapore Chamber of Commerce quotations per picul were:—Best $7.81, Medium $7.44, Mixed $6.56, as compared with $8.19, $7.75 and $6.75 per picul in October.

Pepper.—Singapore Black was quoted throughout November at $8.12½ per picul, Singapore White dropped 25 cents to $12.00 per picul, the average price for the month being $12.19. Muntok White also declined 25 cents to $12.25 per picul, the average price being $12.44 per picul. Average prices per picul in October were $8.03, $12.19 and $12.70 respectively.

Nutmegs.—Both 110's and 80's were quoted in Singapore throughout November at $28.00 per picul. In Penang dried nutmegs were $20 per picul.

Mace.—The Singapore price of Siouw was quoted nominally at $80 per picul; Amboina was $60 per picul throughout the month. In Penang, the price of mace was $85 per picul.

Cloves.—The nominal price in Singapore for both Zanzibar and Amboina cloves was $40 per picul. The Penang price was steady at $45 per picul.

Cardamoms.—The price of green cardamoms as quoted in *The Ceylon Chamber of Commerce Weekly Report* for 28th November, 1938, was from Rs.1.00 to Rs. 1.10 per lb.

Miscellaneous.

Derris.—The downward tendency of prices reported last month still prevails in Singapore. Average prices in November were:—for root sold on basis of ether extract \$10 to \$11 per picul; for root sold on basis of rotenone content \$17.50 to \$19 per picul. Growers are hesitant to dispose of their crop at these levels, but exporters state that the demand in consuming countries does not justify better prices at present.

Our New York correspondent reports on November 7th that the New York price of derris has declined further, 5 per cent. elliptica root ruling at about 5½d. c.i.f. New York, and 17 per cent. malaccensis at 4½d. Offerings of high-bearing derris root from Java are appearing from numerous quarters, but ideas of price appear to be somewhat higher than equivalent value warrant.

There is now only a 4 cent spread between the prices at which derris and cube powders are offered to agricultural buyers, against a spread of 10 to 11 cents a year ago. It is believed that purchases of derris root for the coming season are considerably in excess of last year.

Gambier.—Singapore quoted Block gambier at \$7 per picul (nominal) and Cube No. 1 at \$15 per picul.

Tapioca.—Prices in Singapore of all grades of tapioca remained unaltered during the month: Flake Fair \$4.10, Seed Pearl \$3.90 and Pearl Medium \$4.50 per picul.

Sago.—In Singapore, Pearl sago dropped 10 cents to average \$3.77, and Flour Sarawak Fair dropped 7½ cents to average \$2.18 per picul. Average prices in October were \$3.18 and \$2.16 per picul respectively.

Tobacco.—Prices continue to vary in different parts of the country. In Kelantan the price remains high, 1st grade being per picul \$120 to \$160, 2nd grade \$80 to \$126, 3rd grade \$70 to \$112. In Kedah the three grades were \$33 to \$35 \$21 to \$26.50, \$14 to \$16; in Penang \$35, \$24 and \$15. Prices dropped in Perak South, 1st grade \$21 to \$33, 2nd \$17 to \$24, 3rd \$10 to \$20. In Malacca the price was \$23 to \$25, and in Johore there continued to be a wide range of prices depending on local demand, quality and class of leaf, Javanese tobacco commanding a premium over Chinese leaf.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note:— The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY *

October, 1938.

Malaya.—The imports of foreign rice during October were 78,525 tons,† exports were 18,082 tons, net imports therefore were 60,443 tons, as compared with 50,015 tons in September 1938, and 37,261 tons in October 1937.¶

Gross imports for the first 10 months of 1938 were 691,986 tons, exports were 163,649 tons, net imports being 528,337 tons.

Of the October 1938 imports, 47 per cent. were consigned to Singapore, 16 per cent. to Penang, 8 per cent. to Malacca, 21 per cent. to the Federated Malay States and 8 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):— Siam 47,500 (60.5), Burma 26.793 (31.1), French Indo-China 3,154 (4.0), elsewhere 1,078 (1.4).

Of exports during October, 80 per cent. were consigned to the Netherlands Indies and 20 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):— Siam 13,916 (77.0), Burma 3,546 (19.6), French Indo-China 516 (2.8), Parboiled 50 (0.3), Malayan 54 (0.3).

Net imports of rice during October by countries of origin were, in tons:— Siam 33,584, Burma 23,247, French Indo-China 2,638, elsewhere 974.

India.—Foreign exports January to September were 205,000 tons, as compared with 641,000 in 1937, a decrease of 68.0 per cent. Of these 2.4 (4.1) per cent. were to the United Kingdom, 3.9 (5.9) per cent. to the Continent of Europe, 39.0 (28.4) per cent. to Ceylon, 4.9 (22.0) per cent. to the Straits Settlements and the Far East, and 49.8 (39.6) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

According to the first rice forecast of All-India for the season 1938-39, the area under rice is estimated at 65,812,000 acres, an increase of 1.4 per cent., as compared with 64,873,000 (revised) acres. The crop is reported to have been affected by heavy rains and floods and its condition to be fair on the whole.

Burma.—Foreign exports 1st January to 26th October 1938 were 2,747,727 tons, as compared with 2,834,880 tons in 1937, a decrease of 3.1 per cent. Of 1938 exports, 40.3 (44.6) per cent. were to India, 11.3 (9.0) per cent. to the United Kingdom, 9.3 (10.6) per cent. to the Continent of Europe, 12.1 (11.5) per cent. to Ceylon, 14.7 (14.1) per cent. to the Straits Settlements and the Far East, and 12.3 (10.2) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

Average October prices in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 220, Small Mills Specials 232.

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* Abridged from the Rice Summary for October, 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

The first forecast for the 1938-39 rice crop of Burma estimates the area likely to mature at 12,677,600 acres, an increase of 0.7 per cent. as compared with the final figures for last year.

The monsoon has been generally very favourable in Lower Burma and the wet zone of Upper Burma, and, except for a rather prolonged break in the middle rains, in the dry zone also. There has been an almost complete absence of serious flooding. The favourable season is reflected in the great decrease in the area estimated to be destroyed as compared with last year and the corresponding increase in the estimated matured area. Standing crops are for the most part in good condition and if normal rainfall is received during the next few weeks an excellent crop may be expected.

Siam.—Exports of rice and rice products from Bangkok during August were 117,877 tons, making a total of 1,049,082 tons for the first 8 months of 1938, as compared with 640,032 tons in 1937.

Based on telegraphic reports from 60 Provinces, the rice crop conditions at the end of September were as follows:— Cultivated Area: The total area sown is 6,476,041 acres, as compared with 6,587,795 acres at the same time last year, a decrease of 111,754 acres.

The damaged area was stated to be 357,171 acres, as compared with 398,994 acres at the same time last year. As a whole, the present crop is said to be generally satisfactory with 33 Provinces doing well, 26 doing fairly well and 1 Province not doing well.

Japan.— The first estimate of the 1938 rice crop of Japan is reported at 9,082,478 tons, a decrease of 214,537 tons or 2.3 per cent. as compared with last year's actual crop.

The area under rice in Japan during 1938 amounted to 7,877,437 acres, an increase of 3,112 acres or 0.04 per cent. over 1937.

Plantation acreages and actual yields for the previous five years are:—

	Plantation Acreage (In acres)	Real Crop (In tons)
1933 ...	7,769,975	9,931,266
1934 ...	7,769,459	7,267,506
1935 ...	7,845,278	8,053,892
1936 ...	7,850,334	9,440,560
1937 ...	7,874,325	9,297,015

French Indo-China.—Entries of padi into Cholon during the first 10 months of 1938 amounted to 909,937 tons, as compared with 1,296,488 tons in 1937, a decrease of 29.8 per cent. Exports during the same period were 959,759 tons, as compared with 1,326,493 tons in 1937, a decrease of 27.6 per cent.

Saigon prices declined during October—padi from \$2.42 per picul to \$2 34 per picul, while rice fell from \$3.61 per cent. to \$3.54, but recovered to \$3.57 per picul.

The Netherlands Indies —The area harvested in Java and Madoera during January to June 1938 amounted to 7,197,580 acres, a decrease of 1.0 per cent. as compared with 7,266,740 acres in 1937.

Imports into Java and Madoera January to June 1938 were 21,886 tons, as compared with 1,488 tons in 1937, an increase of 1,370.8 per cent. During the same period imports into the Outer Provinces were 144,379 tons, as compared with 61,809 tons in 1937, an increase of 133.6 per cent.

Ceylon.—Imports of rice during the first 10 months of 1938 were 459,956 tons as compared with 443,959 tons in 1937, an increase of 3.6 per cent.

Of these imports, 18.3 (17.2) per cent. were from British India, 69.6 (70.0) per cent. from Burma, 0.2 (0.1) per cent. from the Straits Settlements and 11.9 (12.7) per cent. from other countries. The figures in brackets are for the corresponding period of 1937.

Europe and America.—Shipments of rice from the East to Europe from the 1st January to 7th October were 1,034,665 tons, as compared with 948,726 tons in 1937, an increase of 9.1 per cent. Of these shipments, 40.3 (43.9) per cent. were from Burma, 48.8 (49.8) per cent. from Saigon, 9.6 (4.5) per cent. from Siam, and 1.3 (1.8) per cent. from Bengal. The figures in brackets are for the corresponding period in 1937.

Shipments to the Levant from 1st January to 20th September were 31,071 tons, as compared with 14,387 tons in 1937, an increase of 116.0 per cent.

Shipments for Cuba, West Indies and America from 1st January to 19th September were 162,279 tons, as compared with 209,184 tons in 1937, a decrease of 22.4 per cent.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Sept. 1937	Jan./Sept. 1938	September 1937	September 1938
Arecanuts ...	30,084	23,241	27,926	2.747	1.543
Coconuts fresh ...	95,223†	69.487†	76,907†	10,282†	8,398†
Coconut oil ...	39,762	29.521	33,574	4,114	4.759
Copra ...	75,592	50,171	37,879	9,651	9,611
Gambier, all kinds ...	1,955	1,536	1.208	232	104
Copra cake ...	15,026§	11.010§	5.004	1,503	376
Palm kernels ...	7,312	4.641	6,292	537	880
Palm oil ...	42,787	31,079	41.999	2,911	6,353
Pineapples, canned ...	80,502	68,769	59,987	4,180	4.949
Rubber ...	503,127¶	366,892¶	283,324¶	46.047¶	25,831¶
Sago,—flour ...	15,478	10,397	3,395	1,883	1,044
,, —pearl ...	3,759	2,563	3.181	452	420
,, —raw ...	8,256*	5,951*	4,020*	662*	463*
Tapioca,—flake ...	1,058	838	687	121	56
,, —flour ...	2,393*	1,678*	2,390*	365*	148*
,, —pearl ...	18,786	12,851	13,441	2.807	1.598
Tuba root ...	573	480	407	48	71

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
July	2,546.5	2,134.2	450.8	311.0
August	3,587.4	2,798.1	587.8	437.0
September	3,415.9	1,779.2	591.4	289.0
October	2,817.9	2,056.3	483.0	304.0
Total ...	24,238.3	17,761.7	4,258.2	2,901.0
Total January to October, 1937	23,011.1	14,833.4	4,116.5	2,392.5
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 31st October, 1938, were palm oil 2,578 tons, palm kernels 1,017 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST OCTOBER, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of Tappable Rubber Not Tapped: Estates which have entirely ceased tapping: Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems: Acreage	Percentage of (7) to (2)	Under rotational systems: Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped: Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,334	19,069	44.0	932	2.1	14,929	34.5	8,404	19.4	443	1.0	24,265	56.0
Malacca ...	121,481	56,823	46.8	2,936	2.4	31,706	26.1	30,016	24.7	1,693	1.4	64,658	53.2
Penang ...	2,478	1,200	48.4	nil	nil	1,218	49.2	60	2.4	9	0.4	1,278	51.6
Singapore ...	32,133	14,833	46.2	5,030	15.6	7,140	22.2	5,130	16.0	83	0.3	17,300	53.8
Total S.S. ...	199,426	91,925	46.1	8,898	4.4	54,993	27.6	43,610	21.9	2,228	1.1	107,501	53.9
F. M. S.—													
Perak ...	285,783	153,832	53.8	9,243	3.3	69,495	24.3	53,213	18.6	6,990	2.4	131,951	46.2
Selangor ...	322,747	193,440	59.9	6,909	2.2	58,830	18.2	63,568	19.7	6,416	2.0	129,307	40.1
Negri Sembilan ...	254,734	134,132	52.7	10,347	4.0	60,824	23.9	49,431	19.4	7,176	2.8	120,602	47.3
Pahang ...	86,498	42,612	49.3	7,067	8.1	25,847	29.9	10,972	12.7	6,357	7.3	43,886	50.7
Total F.M.S. ...	949,762	524,016	55.2	33,566	3.5	214,996	22.6	177,184	18.7	26,939	2.8	425,746	44.8
U. M. S.—													
Johore ...	476,342	265,290	55.7	18,868	4.0	123,653	25.9	68,531	14.4	33,015	6.9	211,052	44.3
Kedah ...	199,207	112,941	56.7	9,160	4.6	35,880	18.0	41,226	20.7	5,286	2.7	86,266	43.3
Kelantan ...	31,406	18,576	59.1	253	0.8	7,202	23.0	5,375	17.1	2,266	7.2	12,830	40.9
Trengganu (b) ...	4,817	3,159	65.6	nil	nil	97	2.0	1,561	32.4	74	1.5	1,658	34.4
Perlis (c) ...	1,371	621	45.3	262	19.1	354	25.8	134	9.8	75	5.5	750	54.7
Brunei ...	5,746	2,440	42.5	nil	nil	2,646	46.0	660	11.5	247	4.3	3,306	57.5
Total U.M.S. ...	718,889	403,027	56.1	28,543	4.0	169,832	23.6	117,487	16.3	40,963	5.7	315,862	43.9
Total MALAYA ...	1,868,077	1,018,968	54.5	71,007	3.8	439,821	23.6	338,281	18.1	70,130	3.8	849,109	45.5

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only
(c) Figures for the quarter ending 30th September, 1938.

MALAYAN RUBBER STATISTICS Table I.

Acreage, Stocks, Production, Imports and Exports of Rubber, including Latex, Concentrated Latex and Revertex, for the month of October, 1938 in Dry Tons.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Oct. 1938	during the month	Jan. to Oct. 1938	during the month: Foreign	during the month: From Malay States & Labuan	January to Oct. 1938: Foreign	January to Oct. 1938: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to Oct. 1938: Foreign	January to Oct. 1938: Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Oct. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	6,384	21,043	9,816	109,133	5,647	49,888	Nil	Nil	Nil	Nil	9,734	3,365	*118,770 †116,377	35,855	...	8,059	21,716	16	161
Johore ...	...	3,074	8,748	4,279	49,435	1,906	28,544	Nil	48	Nil	299	1,729	5,687	28,219	49,054	...	2,136	8,503	...	...
Kedah ...	...	217	4,997	2,257	26,645	750	8,281	Nil	Nil	Nil	Nil	1,369	1,849	16,392	17,660	...	260	4,743	...	...
Perlis ...	...	19	30	9	121	21	208	Nil	Nil	Nil	Nil	Nil	34	Nil	309	...	20	25	...	...
Kelantan ...	...	739	653	314	3,564	605	5,980	Nil	Nil	Nil	Nil	263	840	2,761	6,661	...	550	658	...	...
Trengganu ...	...	55	50	333	2,540	166	1,274	Nil	Nil	Nil	Nil	Nil	499	5	3,809	...	55	50	...	...
Brunei ...	...	Nil	76	40	449	75	663	...	...	...	...	...	93	...	1,089	...	14	48	...	...
Total Malay States	...	10,488	35,597	17,048	191,887	9,170	94,838	Nil	48	Nil	299	13,095	12,367	166,147	114,437	...	11,094	35,779	16	161
S. SETTLEMENTS :—																				
Malacca ...	...	1,986	2,066	915	10,694	190	5,013	Nil		Nil		1,839		23,029		...	2,189	1,993	...	...
Province Wellesley	...	2,463	884	365	4,007	189	2,048	Nil		Nil						...	2,512	836	...	...
Penang ...	1,802	5,087	10	15	175	41	774	3,109	11,424	25,408	116,719	7,463	Nil	73,034	Nil	1,186	4,929	14	...	...
Singapore ...	3,739	24,770	288	105	1,390	51	481	13,430		112,392		19,897		192,460		5,132	23,663	276	27	250
Labuan ...	...	33	Nil	Nil	Nil	7	113	60		475		Nil		Nil		...	27	Nil	...	...
Total Straits Settlements ...	5,541	34,339	3,248	1,400	16,256	478	8,429	16,599	11,424	138,275	116,719	29,199	Nil	288,523	Nil	6,318	33,320	3,119	27	250
Total Malaya ...	5,541	44,827	38,845	18,448	208,153	9,648	103,267	16,599	11,472	138,275	117,018	42,294	12,367	454,670	114,437	6,318	44,414	38,898	43	411

*Ocean Shipments from Malaya of rubber directly consigned from F.M.S. †Exports of rubber from F.M.S.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	7,137	22,936	4,701	4,484	1,706	108
WET RUBBER	922	727	228	258	430	152
TOTAL ...	8,059	23,663	4,929	4,742	2,136	260

TABLE III
FOREIGN EXPORTS

PORTS 29	For month 30	Jan. to Oct. 1938 31
Singapore ...	27,983	303,442
Penang ...	11,065	107,358
Port Swettenham.	3,070	41,839
Malacca ...	176	2,031
MALAYA ...	42,294	454,670

TABLE IV
DOMESTIC EXPORTS 4

AREA 32	For month 33	Jan. to Oct. 1938 34
Malay States ...	25,437	277,582
Straits Settlements	1,859	23,456
MALAYA ...	27,296	301,038

Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.

METEOROLOGICAL SUMMARY, MALAYA, OCTOBER, 1938.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.7	71.6	80.7	96	69	81	75	83.3	84.5	9.47	240.5	2.45	18	18	8	7	1	182.60	5.89	49
Bukit Jeram, Selangor ...	89.0	72.1	80.5	93	70	76	74	85.0	86.7	5.46	138.7	1.36	14	12	1	2	—	199.70	6.44	53
Sitiawan, Perak ...	88.3	72.6	80.5	91	68	84	75	83.8	84 6	3.19	81.0	0.87	15	11	3	2	—	178.25	5.75	48
Ipoh Aerodrome, Perak ...	89.8	71.9	80.9	94	68	86	75	83.3	84.1	10.53	267.5	4.42	16	10	9	—	—	185.35	5.98	49
Temerloh, Pahang ...	91.2	72.1	81.7	95	69	86	75	85.4	86.8	7.21	183.1	2.95	14	12	2	7	1	185.20	5.97	49
Kuala Lipis, Pahang ...	89.8	70.8	80.3	95	68	84	74	83.9	85.1	10.95	278.1	3.16	20	17	4	25	2	175.80	5.67	47
Kuala Pahang, Pahang ...	87.3	74.2	80.7	93	71	80	77	84.8	87.3	12.61	320.3	4.74	14	13	5	1	1	226.90	7.32	60
Kallang Aerodrome, S'pore ...	86.2	75.6	80.9	89	72	83	80	83.1	83 8	6.33	160.8	1.48	14	12	3	—	—	182.55	5.89	49
Bayan Lepas Aerodrome Penang ...	86.8	74.1	80.5	90	69	82	78	83.6	84 3	7.12	180.8	0.89	21	21	2	—	—	191.10	6.16	51
Malacca Town, Malacca ...	85.5	73.5	79.5	88	70	82	77	84.0	85.1	12.41	315.2	2.62	17	14	8	1	2	210.45	6.79	56
Kluang, Johore ...	88.7	71.1	79.9	93	69	84	74	82 0	82.6	6.00	152.4	1.39	21	18	6	12	—	175.40	5.66	47
Mersing, Johore ...	87.4	71.9	79.7	92	70	83	76	82.3	82.5	9.30	236.2	2.40	17	14	6	—	1	207.65	6.70	55
Alor Star, Kedah ...	87.3	73.7	80.5	90	70	79	77	84.3	85.1	5.97	151.6	1.70	17	13	1	2	—	199.25	6.43	53
Kota Bahru, Kelantan ...	88.0	73.1	80 5	92	71	79	75	84.2	85.1	8.46	214.9	4.20	18	12	3	—	—	205.15	6.62	55
Kuala Trengganu, Trengganu	87.6	72.5	80.1	92	70	78	74	82.7	85 2	8.77	222.8	2.13	22	19	4	1	—	209.70	6.76	56
Labuan ...	87.3	76.7	82.0	91	72	81	80	85.7	86.6	10.43	264.9	2.50	17	15	2	—	1	198.60	6.41	53
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	73.9	62.4	68.1	78	61	68	64	71.3	72.2	18.06	458.7	6.77	23	16	2	12	1	169.20	5.46	45
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.5	56 3	63.9	75	50	68	62	70.1	73.7	10.25	260.4	2.39	25	20	—	—	3	131.50	4.24	35
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.7	59.0	65.3	76	57	66	61	*	*	11.21	284.5	2.98	22	18	*	*	3	141.75	4.57	38

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

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